



MT5634ZBA-V-V92

**Modem with Voice, V.92 Data,
and Super G3 Fax**

User Guide



MultiModemZBA-V-V92 User Guide

MT5634ZBA-V-V92

S0000244 Revision A

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Patents

This device is covered by one or more of the following patents: 6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; D394,250; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; D374,222; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; D361,764; D355,658; D355,653; D353,598; D353,144; 5,355,365; 5,309,562; 5,301,274. Other patents pending.

Notice

Though this modem is capable of 56K bps download performance, line impairments, public telephone infrastructure, and other external technological factors currently prevent maximum 56K bps connections.

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Chapter 1

Introduction

Chapter 1 - Introduction

Congratulations on your purchase of the MultiModemZBA-V-V92 modem. You have acquired one of the finest intelligent voice/data/fax modems available today from one of the world's oldest modem manufacturers: Multitech Systems, Inc. This user guide will help you to install, configure, test and use your modem.

Product Description

The Multi-Tech MT5634ZBA-V-V92 external modem provides high-speed data transfer and fax capabilities for small businesses, telecommuters, and SOHO users. Its support of the ITU-T V.92 protocol enables downstream transmissions at speeds up to 56 Kbps* and upstream transmissions at speeds up to 48 Kbps when connected to V.92-compatible Internet service providers. Transmissions between the MT5634ZBA-V-V92 and other client modems are limited to 33.6K bps, as are upstream transmissions to non-V.92-compatible ISPs and downstream transmissions that are converted more than once on the telephone network.

The MT5634ZBA-V-V92 also supports "Super G3" ITU-T V.34 fax communications at speeds up to 33.6K bps with Class 2.1 fax commands.

Modem features include Plug and Play operation, callback security, and remote configuration. In standard mode, the modem can store up to four command lines or telephone numbers of up to 40 characters each in nonvolatile memory. In callback security mode, it can store up to 30 passwords and dialing strings. Other modem capabilities include modem-on-hold, AT&T calling card tone detection, pulse and tone dialing, adaptive answer, DTR dialing, U.S. Caller ID reporting, two-wire leased-line operation, 11-bit operation, V.42 error correction, V.42bis and V.44 data compression, and self-resetting lightning protection.

Please note that some V.92 features are turned off in the factory default configuration, and may need to be turned on, depending on your needs. For more information, see "V.92 Operation" on page 17.

*Though this modem is capable of 56K bps download performance, line impairments, public telephone infrastructure, and other external technological factors may prevent maximum 56K bps connections.

We Supply

- ✓ An MT5634ZBA-V-V92 data/fax/voice modem
- ✓ A set of four self-adhesive plastic feet
- ✓ A printed *Quick Start Guide*
- ✓ A MultiModemZBA installation CD containing modem drivers, this *User Guide*, data communications software, and other programs+
- ✓ A universal power supply and, if applicable, a power cord
- ✓ A 9-pin to 25-pin serial cable

A localization kit is included with the modem in some countries, and purchased separately in others. The kit can include any or all of the following items:

- An RJ-11 telephone cable
- An adapter to connect the RJ-11 cable to your local telephone service
- A country-specific power cord

The following illustration shows how the modem is packaged for different countries. Please use this information to check the contents of your package.

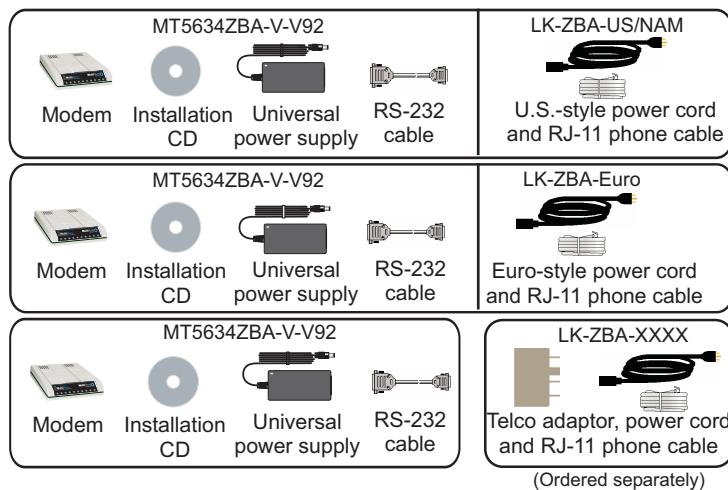


Figure 1–1. Localization kits

The localization kit order number for your country can be found on the Multi-Tech Web site at <http://www.multitech.com/GlobalModem/order/localkits.asp>

If any item is missing, please contact Multi-Tech Systems or your dealer/distributor (see Appendix F for information on contacting Multi-Tech via telephone, fax, or the Internet).

You Supply

- ✓ A computer with an available serial port
- ✓ A nearby AC power outlet
- ✓ A nearby telephone line jack
- ✓ A nearby two-wire leased line jack or terminals (optional)

Chapter 2

Installation

Chapter 2 - Installation

This chapter shows you step-by-step how to set up your Multi-Tech data/fax/voice modem and make your first calls.

Safety Warnings

- Use this product only with UL- and CUL-listed computers (U.S.A. and Canada)
- To reduce the risk of fire, use only 26 AWG (.41mm) or larger telephone wiring.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone during an electrical storm; there is a risk of electrical shock from lightning.
- Do not use a telephone in the vicinity of a gas leak.

Step 1: Mount the Feet

The modem comes with a strip of self-adhesive plastic feet, which you can optionally mount on the modem. To install the feet, simply peel them from their paper strip and press them into the recesses on the bottom of the modem.

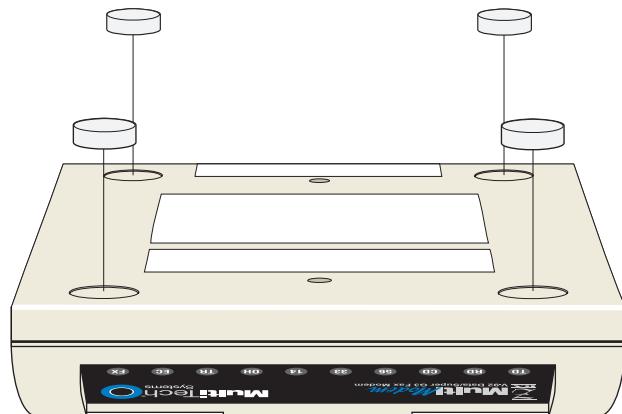


Figure 2-1. Mounting the feet.

Step 2: Change the Internal Jumpers

This step is required only if:

- ✓ You intend to use the modem on a leased line.
- ✓ You intend to add a monophonic external speaker to your modem with the voice option. No changes are needed for stereo.

This will require you to open the modem and move one or more jumpers on the modem's printed circuit board.

Warning: The following procedure must be performed by authorized service personnel.

Caution: The circuit board can be harmed by static electricity. Before you open the case, touch a grounded object, such as the metal chassis of your computer, to discharge any static electricity in your body, then touch the metal shell of the modem's RS-232 connector to ensure that there is no voltage difference between you and the modem.

Opening the Modem

1. If the modem is connected, turn it off and remove all connecting cables, including the power and line cables.
2. Turn the modem upside down.
3. On the bottom of the modem are two screws, which hold the case together. Remove both screws and set them aside.
4. Turn the modem right side up.
5. Remove the top part of the modem case.
6. To close the modem, reverse Steps 1–5.

Location of the Jumpers

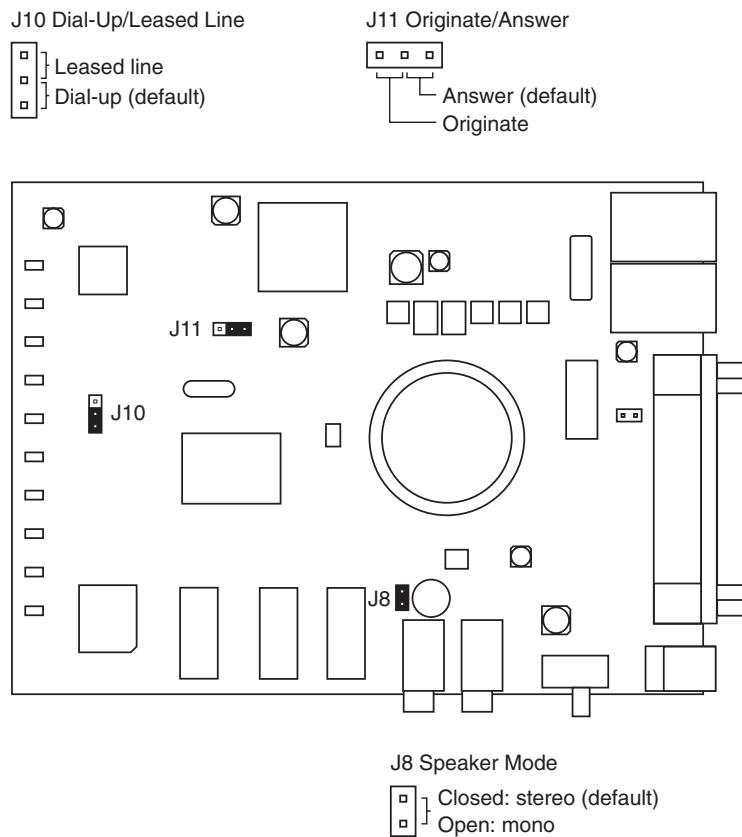


Figure 2-2. Internal jumpers

Changing the Dial-Up/Leased-Line Jumpers

As shipped from the factory, your modem is configured for normal dial-up operation. That is, the modem must dial a phone number to connect to another modem. To use the modem on a leased line, you must change jumper J10 to select leased line operation, and J11 to select whether it will be the originating or the answering modem. If dial-up operation is selected, J11 has no effect.

See Chapter 3 for additional leased line information.

- The factory default is the answer position. This makes the modem the answering modem on the leased line.
- To use the modem on a leased line, move the J10 jumper plug from the default dial-up position to the leased line position.
- To make the modem the originating modem on the leased line, move the J11 jumper plug to the originate position.

Changing the Voice Jumper

The speaker jumper (J8) is next to the external speaker jack (see Figure 2-2).

- The factory default position of the voice jumper is set for a stereo speaker or sound card. A jumper plug covers both pins of the J8 jumper.
- To use the modem with a monophonic external speaker, remove the jumper plug from the J8 jumper pins. You can store it by placing it on one jumper pin.

Step 3: Connect the Modem to Your System

Turn off your computer. Place the modem in a convenient location, and then connect it to your computer's serial port, the telephone line or leased line, AC power, and, optionally, your telephone.

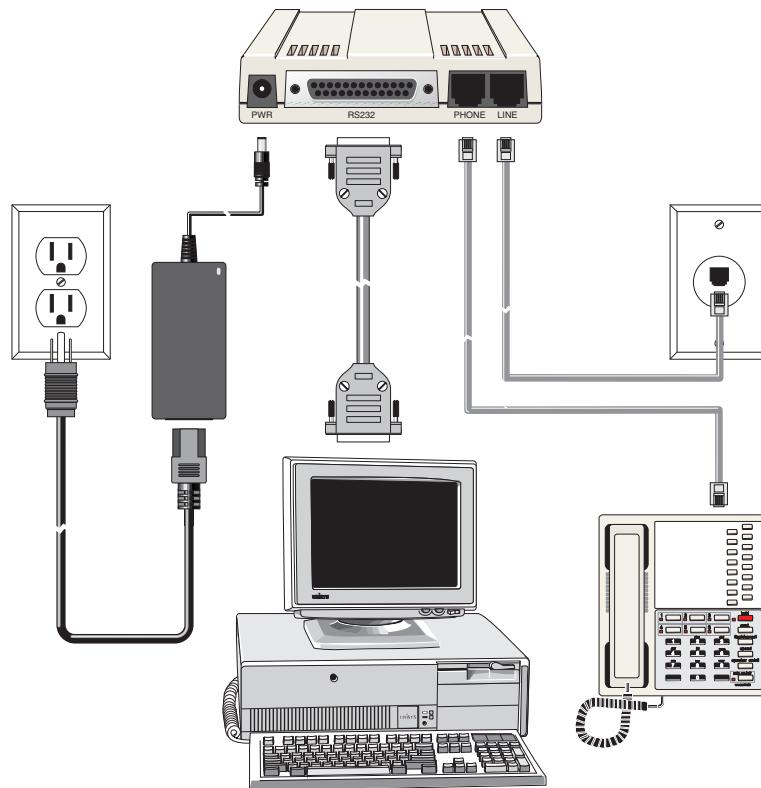


Figure 2-3. MultiModemZBA connections.

Connect the Modem to You PC

Plug one end of the serial cable into the RS232 connector on the modem and the other end into a serial port connector on your computer, such as COM1 or COM2.

Connect the Modem to the Telephone Line

Plug one end of the modular telephone cable into the modem's LINE jack and the other end into a standard phone wall jack.

Important: The LINE jack is not interchangeable with the PHONE jack. Do not plug the telephone into the LINE jack or the line cable into the PHONE jack.

Note: Regulatory agencies may impose certain restrictions on equipment connected to public telephone systems. For more information, see Appendix A.

Connect the Two-Wire Leased Line

Plug one end of a two-wire telephone cable into the modem's LINE jack and the other end to a two-wire leased line wall jack or terminals.

Note: Before you can use the modem on a leased line, you must first change the internal jumpers. See "Step 2: Change the Internal Jumpers."

Connect the Modem to a Phone (Optional)

If you want to connect a phone to same line as the modem, plug it into the modem's PHONE jack.

Important: The PHONE jack is not interchangeable with the LINE jack. Do not plug the telephone into the LINE jack or the line cable into the PHONE jack.

Connect a Microphone and/or Speakers (Optional)

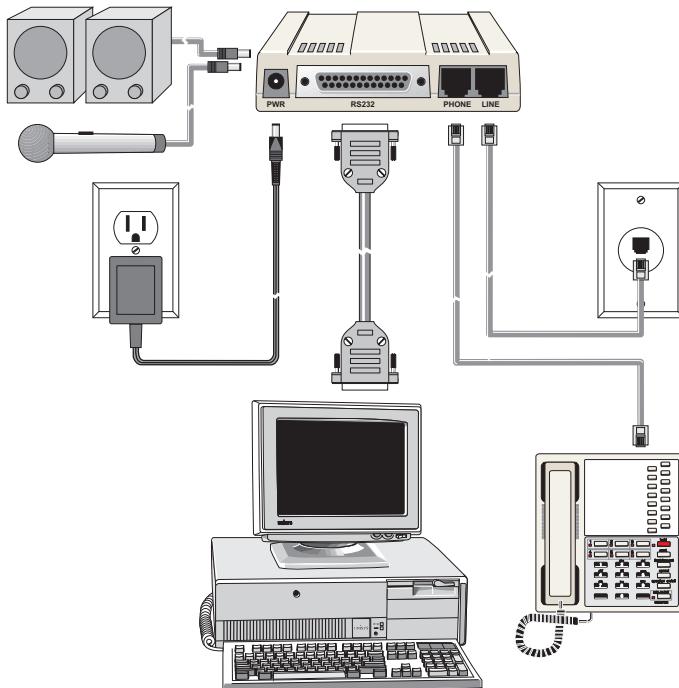


Figure 2-4. MultiModemZBAV connections.

Connect the Microphone

For voice mail or speakerphone applications, plug an unamplified microphone into the MIC jack on the side of the modem. The microphone should have a stereo 1/8-inch mini plug. Do not use a monophonic microphone.

Connect the Speakers

For speakerphone or voice mail applications, use a 1/8-inch plug male-to-male stereo patch cord to connect the SPKR jack on the side of the modem to the LINE IN jack on your sound card. If your sound card does not have a LINE IN jack, use its MIC jack. The stereo male-to-male patch cord can be purchased at a local PC retail store.

If you do not have a sound card, you can plug an unamplified speaker directly into the SPKR jack.

Connect the Modem to the AC Power Outlet

The power switch is located on the right side of the modem. Make sure it is set to OFF. Plug the universal power supply into the PWR jack on the modem. Then plug one end of the country-specific power supply cord into the universal power supply and the other end into a power outlet or power strip.

Note: Use only the power supply supplied with the modem. Use of any other power supply voids the warranty and can damage the modem.

Power-On Test

Test the modem by turning it on. When you turn it on, the modem performs a diagnostic self-test, after which the 56 indicator should light. If this does not happen, check that the power switch is on, the power supply is solidly connected, and the AC outlet is live. If these measures do not work, see Chapter 8, "Solving Problems."

Surge Protectors and Lightning

Your modem has automatic, self-resetting protection to protect it from lightning-induced electrical spikes on the telephone line. Nonetheless, large power surges and nearby lightning strikes can damage or destroy your modem. Therefore, we recommend that you plug the modem into a surge protector rather than directly into a wall outlet, preferably a surge protector that provides protection against electrical spikes on the telephone line as well as on the power line. Note that not even a surge protector can guard against damage from a nearby lightning strike. During an electrical storm, it is safest to unplug your computer equipment from both the power outlet and the telephone line.

Step 4: Install the Modem Driver

If you use Windows 95 or above, you must install the modem driver. The modem driver tells Windows how to control the modem. In Windows 95 and above, the MTMoh Modem on Hold program is installed at the same time (see Chapter 7). If you use a Linux operating system, please see Appendix F. If you use another operating system, please refer to its documentation for modem installation information.

Installing the Modem Driver

1. Make sure your modem is connected properly, and then turn on your computer. Windows should detect your new modem and open the **Install New Modem** wizard.
Note: If Windows cannot find a modem, your modem may be turned off, it may be plugged into the wrong connector on your computer, or the serial cable may be faulty. See "None of the LEDs Light When the Modem Is Turned On" and "The Modem Does Not Respond to Commands" in Chapter 8, "Solving Problems."
2. Insert the system CD into your CD-ROM drive, and then click **OK**.
3. Windows installs the modem driver.
4. Click **Finish** to exit.

Removing an Old Modem Driver

When a new modem replaces another modem, the old modem driver remains in Windows, and the old modem driver is still selected in HyperTerminal and other Windows applications. Though you can change the application connection descriptions one at a time, it is easier to force Windows applications to use the new modem by removing the old modem driver from Windows.

1. Click the **Start** button, point to **Settings**, and click **Control Panel**.
2. Double-click the **Modems** icon to open the **Modems Properties** dialog box.
3. In the list box, select the old modem.
4. Click **Remove**, and then click **Close**.
5. The next time you dial a HyperTerminal connection, it will select your new modem and ask you to confirm the selection.

Step 5: Configure the Modem for Your Country

Different countries have different requirements for how modems must function. Therefore, before you use your modem, you must configure it to match the defaults of the country in which you are using it. You must also do this if you move the modem to another country after it has been configured for the first country. You can use one of two configuration methods:

1. Use the Global Wizard to Configure Your Modem
2. Use AT Commands to Configure Your Modem

Using the Global Wizard to Configure Your Modem

The Global Wizard configuration utility is recommended for computers running Windows 95 or newer.

1. Insert the MultiModemZBAV-V92 CD into the CD-ROM drive. The **Autorun** menu should appear.
2. Click **Initial Setup and Country Selection**.
3. Choose either:
 - **Run Global Wizard from CD.** This will not load the wizard onto your hard drive, or
 - **Install Global Wizard on the HD.** This will install the wizard onto your hard drive for future use.
4. The Global Wizard dialog box appears. Click **Next**.
5. The Global Wizard searches for your modem and identifies it. Click **Next**.
6. Select the country in which the modem will be used. Click **Next**.
7. Review your choice of country. If it is correct, click **Next** to configure the modem.
8. When Global Wizard announces that the parameters have been set, click **Finish** to exit.

Using AT Commands to Configure Your Modem

Non-Windows users can configure the modem using AT commands. You must enter these commands in your communication program's terminal window.

1. Run your favorite communication program, and open the program's terminal window.
2. To configure the modem for a specific country, type **AT%T19,0,nn**, where **nn** is the country code in hexadecimal notation, and then press ENTER. The message **OK** displays.
3. To verify the change, type **ATI9** and press ENTER. The country code displays in decimal format.

Country	AT Command (hexadecimal)	Result code (decimal)
Euro/NAM	AT%T19,0,34 (default)	52

A complete list of country codes can be found on the Multi-Tech Web site at
<http://www.multitech.com/GlobalModem/config>.

Step 6: Install and Configure Your Software

You may use either the communication program included with your modem or a third-party program. Communication programs designed for Windows 95 and above normally do not need to be manually configured, since they obtain configuration information from Windows. Communication programs designed for DOS and other operating systems, however, may need to be manually configured to work with your modem. Though each communication program is different, the following procedure should work with most of them.

1. Install and run your communication program.
2. Find the dialog box or menu that lets you select your modem. (In Windows Terminal select **Settings | Modem Commands**; in HyperTerminal select **File | Properties | Phone Number**; and in PhoneTools select **Configure | General Configuration | Communication | Change Modem**.)
3. Choose your modem from the program's modem list. If it isn't listed, choose a generic modem and modify the settings as necessary.
4. Change the modem initialization string, if necessary. The factory default configuration works well for most purposes. To load the factory default configuration, use **AT&F**. To load a custom configuration that was saved using the **&W** command, use **ATZ**. For a Macintosh, the initialization string should include the **&D0** command. If you do not want the modem to always answer the phone, add **S0=0** to the string. To use Caller ID with the modem, add **S0=2** to the string (Caller ID information is sent between the first and second rings, so the phone must ring at least twice before the modem picks up the line). Depending on the software, you might have to end the string with a carriage return character (^M).

Note: To change the modem's default configuration, type new commands in the communication program's terminal window, adding the **&W** command to store them in the modem's nonvolatile memory. For instance, to create a default configuration that turns off autoanswer, type **AT&FS0=0&W**. The new configuration loads automatically whenever the modem is turned on or receives the **ATZ** command.

5. Select the port the modem is connected to (normally COM1 or COM2).
6. Select your serial port speed. This can be labeled "maximum speed," "DTE bps," or "baud rate." Ideally, if you use data compression, you should set your serial port baud rate to four times the modem's maximum transmission speed or faster; however, few files can be compressed enough to require speeds that high, and not all serial ports can handle speeds that high.
7. If the communication program has an autobaud selection, make sure it is disabled. Autobaud applies only to older modems, and can cause problems if enabled.
8. If the program allows you to edit the no-connect messages (*NO CARRIER*, *BUSY*, *NO ANSWER*, *NO DIALTONE*), make sure there is no space between *DIAL* and *TONE* in *NO DIALTONE*.
9. Refer to the program manual or online help for other configuration choices. In most cases you can accept the default values.

Chapter 3

Operation

Chapter 3 - Operation

Your Multi-Tech modem operates under the control of a communication program, such as the PhoneTools program included with the modem. It also can operate under other general-purpose data communication programs, such as Windows HyperTerminal. For information on how to use the modem with the communication program of your choice, please refer to the program's documentation.

Front Panel

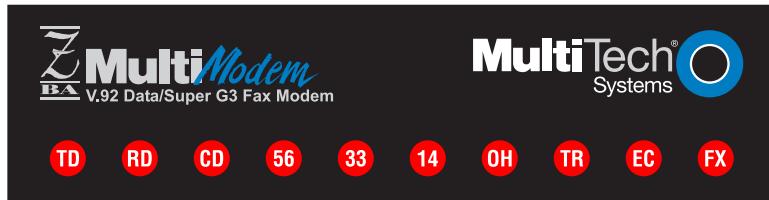


Figure 3-1. Front panel

The MultiModemZBA has ten LED indicators on the front panel, which indicate status, configuration, and activity:



Transmit Data. The **TD** indicator flashes when the modem is transmitting data to another modem.



Receive Data. The **RD** indicator flashes when the modem is receiving data



Carrier Detect. The **CD** indicator lights when the modem detects a valid carrier signal from another modem. It is on when the modem is communicating with the other modem, and off when the link is broken.



56K Mode (56,000–28,000 bps). The **56** indicator lights whenever the modem is set for or connects using the V.90 or V.92 protocol. The actual connection speed depends on ISP server capabilities and line conditions.



V.34 Mode (33,600–16,800 bps). The **33** indicator lights whenever the modem connects using the V.34 protocol.



V.32bis Mode (14,400–12,000 bps). The **14** indicator lights whenever the modem connects using the V.32bis protocol.

Note: Though the modem can connect at lower than V.32bis speeds, no speed indicator lights during the connection.

OH

Off-Hook. The **OH** indicator lights when the modem is off-hook, which occurs when the modem is dialing, online, or answering a call. The LED flashes when the modem pulse-dials.

TR

Terminal Ready. The **TR** indicator lights when a communications program is using the modem. It means the modem is ready for an outgoing or incoming call. It goes off when the communications program disconnects the serial port. When it goes off, a connected modem will also disconnect.

EC

Error Correction (V.42). The **EC** indicator lights continuously when the modem is in V.42 error correction mode, and flashes when compression is activated.

FX

Fax. The **FX** indicator lights when the modem is in fax mode.

Note: When you turn on the modem, the protocol indicators flash briefly as the modem does a self-test, after which the **56** indicator lights. After a call, the indicator for the protocol used in the connection remains lit until another call is made or the modem is reset. If you connect at a rate under 14,400 bps, all protocol indicators remain off after the connection is broken, even though the modem is still turned on.

Configuring the Modem

Your modem normally is configured either through Windows or through the communication program you are using. The default settings work best for most purposes. See “Step 6: Install and Configure Your Software” in Chapter 2 for help in setting up your communication program.

You can also configure your modem directly by typing **AT** commands in the terminal window of a communication program. See Chapter 4 for descriptions of the modem’s **AT** commands.

PhoneTools Features

Using the PhoneTools communications program included with your modem, you can:

- Upload and download data files.
- Send faxes at preset times.
- Store incoming voice messages and faxes.
- Retrieve stored messages, faxes, and telephone numbers (telephone number retrieval requires Caller ID service from your telephone company).
- Print a received fax.

For detailed information about operating your modem under PhoneTools, please refer to the PhoneTools online documentation.

Leased Line Operation

The MultiModemZBA-V-V92 modem can be used on a two-wire leased line.

A leased line is a private, permanent, telephone connection between two points. Unlike normal dialup connections, a leased line is always active. The modems automatically connect when they are attached to the line and are turned on. Because a leased line is always active, one of the two modems on the line must be configured as the originate modem and the other as the answer modem; however, it does not matter which is which.

In the event of an interruption, leased line modems automatically reconnect when the data line or power is restored.

Setup

1. Open the modem and change jumper J10 to select leased-line operation, and jumper 11 to select either originate or answer operation, depending on how you intend to use the modem. See Chapter 2 for the detailed procedure.
2. Connect a modular telephone cable to the LINE jack. Connect the other end of the cable to a two-wire leased line jack or terminals supplied by the telephone company.
3. Turn on the modem.
4. This completes the setup for two-wire leased line operation. Upon completion, the modem attempts to connect to the modem at the other end of the leased line. If the remote modem has not yet been configured for leased line operation, you may turn off the local modem until the remote one is ready.

V.92 Operation

Because the V.92 protocol is new and still largely unsupported by central servers, some features are disabled by default in the initial release of the MT5634ZBA-V-V92 modem. This section describes the status of the V.92 features in the initial release. Please note that the V.92 special features require connection to a V.92-capable server.

- **General.** The V.92 protocol is enabled by default. If the MultiModemZBA-V-V92 detects another V.92 modem during the handshake phase, they will connect in V.92 mode; otherwise, they will connect in V.90 mode or the highest mutually acceptable mode. The AT command that controls this is **+MS=**.
- **Commands.** AT commands specific to the V.92 protocol and the new V.44 compression protocol begin with the plus character (+). These commands are in this manual. Also, the S109 register has been modified to support V.92.
- **PCM Upstream.** PCM Upstream is disabled by default. To upload files at speeds above 33.6 kbps, you must enable PCM Upstream using the command **+PIG=1**. Please note that this requires connection to a V.92-capable server. Also, please note that since upload speeds are affected by line conditions, meeting the previous requirements cannot guarantee speeds above 33.6 kbps.
- **Quick Connect.** Quick Connect, which shortens the handshake time with another V.92 modem, is disabled by default. To enable it, use the command **+PQC=0**. Quick Connect speeds connect times by skipping the line test during the handshake and using the configuration from the last data connection. Quick Connect works best when line conditions are consistent from call to call. If line conditions are variable, enabling Quick Connect can actually **increase** the connect time slightly.
- **Modem on Hold.** Modem on Hold enables you to put a V.92-capable server on hold while you take another call (see Chapter 7). Modem on Hold operation is possible only with the MTMoh Modem on Hold program included with the MT5634ZBA-V-V92. MTMoh is initially supported only on Windows 95, 98, and Me. However, Windows NT, 2000, and XP support is expected soon, and may be available by the time you receive your modem.

Firmware updates for the MT5634ZBA-V-V92 can be downloaded from <http://www.multitech.com/SUPPORT/MultiModemZBA/firmware.asp>. Please see the Appendix for update instructions. MTMoh updates can be downloaded from <http://www.multitech.com/SUPPORT/software/>.

Connecting to the Internet

Your Multi-Tech modem is your gateway to the Internet and the World Wide Web. To access the Internet and Web via your modem, you must establish a dial-up account with an Internet service provider (ISP). To locate an ISP near you, look in a local directory or computer publication. Your ISP should provide you with the following information:

- User name (also called user ID)
- Password
- Access number (the number you call to connect to the server)
- Host name and/or domain name
- Domain Name Server (DNS) server address

If, besides the Web, you use the Internet for e-mail and newsgroups, your ISP should also provide you with the following information:

- E-mail or POP mail address
- POP server address
- Mail or SMTP address
- News or NNT server address

Dial-Up Networking

Before you can connect to the Internet, you must set up a remote-node client program on your computer. The Windows version is called Dial-Up Networking. Dial-Up Networking establishes your connection to the ISP's server, which is the shared computer that manages calls from clients (your computer) to the Internet. Most, if not all, Windows browsers start Dial-Up Networking automatically when you open them.

For instructions on how to set up Dial-Up Networking, consult your ISP or your operating system's online help or printed documentation. Many ISPs include with their service a program that will install and configure Dial-Up Networking automatically for you.

Sending a Fax

You can use the PhoneTools program included with your modem to send and receive faxes directly from your computer. The following procedure uses print capture, which enables you to fax a document directly from the Windows application in which you created it without opening PhoneTools.

1. Install PhoneTools if it is not already installed.
2. Create a document in a Windows application, such as a word processor, graphic editor, or spreadsheet. To fax the document, keep the document open and select the **Print** command from the **File** menu.
3. Select **CAPTURE FAX +BVRP** as the printer driver, and then click **OK**. The **Send Fax** wizard appears.
4. In the **Recipient** section, type the required information or extract it from the Phone Book by clicking .
5. In the **Template** section, optionally select a cover page and type a cover message.
6. Select the document to be sent. The default file when sending from within a Windows application is **Capture.dgr**.
7. Select the date and time to send the document, if you do not want to send it immediately.
8. Click **Finish** to start the transmission.

Chapter 4

*AT Commands
S-Registers
Result Codes*

Chapter 4- AT Commands, S-Registers, and Result Codes

AT commands are used to control the operation of your modem. They are so called because each command must be preceded by the characters **AT** to get the **A**Ttention of the modem.

AT commands can be issued only when the modem is in command mode or online command mode. The modem is in *command mode* whenever it is not connected to another modem. The modem is in *data mode* whenever it is connected to another modem and ready to exchange data. *Online command mode* is a temporary state in which you can issue commands to the modem while connected to another modem. To put the modem into online command mode from data mode, you must issue an *escape sequence* (+++) followed immediately by the **AT** characters and the command, e.g., **+++ATH** to hang up the modem. To return to data mode from online command mode, you must issue the command **ATO**.

To send AT commands to the modem you must use a communications program, such as HyperTerminal or the PhoneTools communications program included with your modem. You can issue commands to the modem either directly, by typing them in the terminal window of the communications program, or indirectly, by configuring the operating system or communications program to send the commands automatically. Fortunately, communications programs make daily operation of modems effortless by hiding the commands from the user. Most users, therefore, need to use AT commands only when reconfiguring the modem, e.g., to turn autoanswer on or off.

The format for entering an AT command is **ATXn**, where *X* is the command and *n* is the value for the command, sometimes called the command *parameter*. The value is always a number. If the value is zero, you can omit it from the command; thus, **AT&W** is equivalent to **AT&W0**. Most commands have a *default* value, which is the value that is set at the factory. The default values are shown in the “AT Commands” section, which begins on the next page.

You must press ENTER to send the command to the modem. Any time the modem receives a command, it sends a response known as a *result code*. The most common result codes are *OK*, *ERROR*, and the *CONNECT* messages that the modem sends to the computer when it is connecting to another modem. For a table of valid result codes, see “Result Codes” at the end of this chapter.

You can issue several commands in one line, in what is called a command *string*. The command string begins with **AT** and ends when you press ENTER. Spaces to separate the commands are optional; they are ignored by the command interpreter. The most familiar command string is the *initialization string*, which is used to configure the modem when it is turned on or reset, or when your communications software calls another modem.

AT Commands

Command:	AT	Attention Code
Values:	n/a	
Description:		The attention code precedes all command lines except A/ and the escape sequence.
Command:	ENTER Key	
Values:	n/a	
Description:		Press the ENTER or RETURN key to execute most commands.
Command:	A	Answer
Values:	n/a	
Description:		Answers an incoming call before the final ring.
Command:	A/	Repeat Last Command
Values:	n/a	
Description:		Repeats the last command string. Do not precede this command with AT . Do not press ENTER to execute.
Command:	Bn	Communication Standard Setting
Values:	$n = 0\text{--}3, 15, 16$	
Default:	1 and 16	
Description:	B0	Select ITU-T V.22 mode when modem is at 1200 bps.
	B1	Select Bell 212A when modem is at 1200 bps.
	B2	Deselect V.23 reverse channel (same as B3).
	B3	Deselect V.23 reverse channel (same as B2).
	B15	Select V.21 when the modem is at 300 bps.
	B16	Select Bell 103J when the modem is at 300 bps.
Command:	Ds	Dial
Values:	$s = \text{dial string (phone number and dial modifiers)}$	
Default:	none	
Description:		Dial telephone number s , where s may up to 40 characters long and include the 0–9, *, #, A, B, C, and D characters, and the L, P, T, W, S, comma (,), semicolon (;), !, @, ^ and \$ dial string modifiers.
		<i>Dial string modifiers:</i>
	L	Redial last number. (Must be placed immediately after ATD .)
	P	Select pulse-dialing until a T is encountered. Affects current and subsequent dialing.
	T	Select tone-dialing until a P is encountered. Affects current and subsequent dialing.
	W	Wait for a new dial tone before continuing to dial. (X2 , X4 , X5 , X6 , or X7 must be selected.)
	,	Pause during dialing for time set in register S8 .
	;	Return to command mode after dialing. Place at end of dial string.
	!	Hook flash. Causes the modem to go on-hook for one-half second, then off-hook again.
	@	Wait for quiet answer. Causes modem to wait for a ring back, then 5 seconds of silence, before processing next

part of command. If silence is not detected, the modem returns a NO ANSWER code.

- ^ Disable data calling tone transmission.
- \$ Detect AT&T call card “bong” tone. The character should follow the phone number and precede the user’s call card number: **ATDT1028806127853500\$123456789**.

Command:	DS=n Dial Stored Telephone Number
Values:	<i>n</i> = 0, 1, 2
Default:	none
Description:	Dials a number previously stored in directory number <i>y</i> by the &Zn=x command. Example: ATDS=3 .
Command:	En Echo Command Mode Characters
Values:	<i>n</i> = 0 or 1
Default:	1
Description:	E0 Does not echo keyboard input to the terminal. E1 Does echo keyboard input to the terminal.
Command:	Fn Echo Online Data Characters
Values:	<i>n</i> = 0, 1
Default:	1
Description:	F0 Enables online data character echo. (Not supported.) F1 Disables online data character echo (included for backward compatibility with some software).
Command:	Hn Hook Control
Values:	<i>n</i> = 0 or 1
Default:	0
Description:	H0 Goes on-hook (hangs up). H1 Goes off-hook (makes the phone line busy).
Command:	In Information Request
Values:	<i>n</i> = 0–5, 9, 11
Default:	None
Description:	I0 Displays default speed and controller firmware version. I1 Calculates and displays ROM checksum (e.g., <i>B399</i>). I2 Checks ROM and verifies the checksum, displaying <i>OK</i> or <i>ER-ROR</i> . I3 Displays default speed and controller firmware version. I4 Displays firmware version for data pump (e.g., <i>17</i>). I5 Displays the board ID: software version, hardware version, and the country ID in hexadecimal format (e.g., <i>s0503a01V, 0, 34</i>). I9 Displays the country code in decimal format (e.g., <i>52</i>). I11 Displays diagnostic information for the last modem connection, such as DSP and firmware version, link type, line speed, serial speed, type of error correction/data compression, number of past retrains, etc.

Command:	Mn	Monitor Speaker Mode
Values:	$n = 0, 1, 2, \text{ or } 3$	
Default:	1	
Description:	M0	Speaker always off.
	M1	Speaker on until carrier signal detected.
	M2	Speaker always on when modem is off-hook.
	M3	Speaker on until carrier is detected, except while dialing.
Command:	Nn	Modulation Handshake
Values:	$n = 0 \text{ or } 1$	
Default:	1	
Description:	N0	Modem performs handshake only at communication standard specified by S37 and the B command.
	N1	Modem begins handshake at communication standard specified by S37 and the B command. During handshake, fallback to a lower speed can occur.
Command:	On	Return Online to Data Mode
Values:	0, 1, 3	
Default:	None	
Description:	O0	Exits online command mode and returns to data mode (see +++AT<CR> escape sequence).
	O1	Issues a retrain and returns to online data mode.
	O3	Issues a rate renegotiation and returns to data mode.
Command:	P	Pulse Dialing
Values:	P, T	
Default:	T	
Description:		Configures the modem for pulse (non-touch-tone) dialing. Dialed digits are pulsed until a T command or dial modifier is received.
Command:	Qn	Result Codes Enable/Disable
Values:	$n = 0, 1$	
Default:	0	
Description:	Q0	Enables result codes.
	Q1	Disables result codes.
Command:	Sr=n	Set Register Value
Values:	$r = \text{S-register number}; n \text{ varies}$	
Default:	None	
Description:		Sets the value of register Sr to the value of n, where n is entered in decimal format. Example: S0=1 .
Command:	Sr?	Read Register Value
Values:	$r = \text{S-register number}$	
Default:	None	
Description:		Reads the value of register Sr and displays it in 3-digit decimal form. For example, S2? gives the response 043.

Command:	T	Tone Dialing
Values:	P, T	
Default:	T	
Description:		Configures the modem for DTMF (touch-tone) dialing. Dialed digits are tone dialed until a P command or dial modifier is received.
Command:	Vn	Result Code Format
Values:	$n = 0 \text{ or } 1$	
Default:	1	
Description:	V0	Displays result codes as digits (terse response).
	V1	Displays result codes as words (verbose response).
Command:	Wn	Result Code Options
Values:	$n = 0, 1, 2$	
Default:	2	
Description:	W0	<i>CONNECT</i> result code reports serial port speed, disables protocol result codes.
	W1	<i>CONNECT</i> result code reports serial port speed, enables protocol result codes.
	W2	<i>CONNECT</i> result code reports line speed, enables protocol result codes.
Command:	Xn	Result Code Selection
Values:	$n = 0\text{--}7$	
Default:	4	
Description:	X0	Basic result codes (<i>e.g.</i> , <i>CONNECT</i>); does not look for dial tone or busy signal.
	X1	Extended result codes (<i>e.g.</i> , <i>CONNECT 46000 V42bis</i>); does not look for dial tone or busy signal.
	X2	Extended result codes with <i>NO DIALTONE</i> ; does not look for busy signal.
	X3	Extended result codes with <i>BUSY</i> ; does not look for dial tone.
	X4	Extended result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
	X5	Extended result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
	X6	Extended result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
	X7	Basic result codes with <i>NO DIALTONE</i> and <i>BUSY</i> .
Command:	Zn	Modem Reset
Values:	$n = 0 \text{ or } 1$	
Default:	None	
Description:	Z0	Resets modem to profile saved by the last &W command.
	Z1	Same as Z0.
Command:	&Cn	Data Carrier Detect (DCD) Control
Values:	$n = 0, 1, \text{ or } 2$	
Default:	1	
Description:	&C0	Forces the DCD circuit to be always high.
	&C1	DCD goes high when the remote modem's carrier signal is detected, and goes low when the carrier signal is not detected.
	&C2	DCD drops on disconnect for time set by S18 , then goes high again (for some CBX phone systems).

Command: **&Dn** **Data Terminal Ready (DTR) Control**
 Values: $n = 0, 1, 2, \text{ or } 3$
 Default: 2
 Description: &D0 Modem ignores the true status of the DTR signal and responds as if it is always on.
 &D1 If DTR drops while in online data mode, the modem enters command mode, issues an *OK*, and remains connected.
 &D2 If DTR drops while in online data mode, the modem hangs up. If the signal is not present, the modem will not answer or dial.
 &D3 If DTR drops, the modem hangs up and resets as if an **ATZ** command were issued.

Command: **&En** **XON/XOFF Pacing Control**
 Values: $n = 12 \text{ or } 13$
 Default: 12
 Description: &E12 Disables XON/XOFF pacing.
 &E13 Enables XON/XOFF pacing. (**&K4** must also be set.)

Note: **&E13** has no effect if hardware control (**&K3**) is selected.

Command: **&Fn** **Load Factory Settings**
 Values: $n = 0$
 Default: None
 Description: &F0 Loads factory settings as active configuration.

Note: See also the **Z** command.

Command: **&Gn** **V.22bis Guard Tone Control**
 Values: $n = 0, 1, \text{ or } 2$
 Default: 0
 Description: &G0 Disables guard tone.
 &G1 Sets guard tone to 550 Hz.
 &G2 Sets guard tone to 1800 Hz.

Note: The **&G** command is not used in North America.

Command: **&Kn** **Flow Control Selection**
 Values: $n = 0, 3, \text{ or } 4$
 Default: 3
 Description: &K0 Disables flow control.
 &K3 Enables CTS/RTS hardware flow control.
 &K4 Enables XON/XOFF software flow control.

Command: **&Qn** **Asynchronous Communications Mode**
 Values: $n = 0, 5, 6, 8, \text{ or } 9$
 Default: 5
 Description: &Q0 Asynchronous with data buffering. Same as **\N0**.
 &Q5 Error control with data buffering. Same as **\N3**.
 &Q6 Asynchronous with data buffering. Same as **\N0**.
 &Q8 MNP error control mode. If MNP error control is not established, the modem falls back according to the setting in **S36**.
 &Q9 V.42 or MNP error control mode. If neither error control is established, the modem falls back according to the setting in **S36**.

Command:	&Sn	Data Set Ready (DSR) Control
Values:	$n = 0$ or 1	
Default:	0	
Description:	&S0	DSR is always high (on).
	&S1	DSR goes high only during a connection.
Command:	&Tn	V.54 Test Commands
Values:	$n = 0, 1, 3$ or 6	
Default:	None	
Description:	&T0	Abort. Stops any test in progress.
	&T1	Initiates local analog loopback test.
	&T3	Initiates local digital loopback test.
	&T6	Initiates remote digital loopback test.
Note:	To stop a test, you must use the escape sequence (+++AT) before typing &T0 .	
Command:	&V	Display Current Settings
Values:	n/a	
Description:	Displays the active modem settings, including the callback security settings if callback security is enabled. If the setup password has been entered, it also displays the callback security passwords.	
Command:	&Wn	Store Current Configuration
Values:	$n = 0, 1$	
Default:	1	
Description:	&W0	Stores current modem settings in nonvolatile memory and causes them to be loaded in place of the factory defaults at power-on or following the ATZ command. See also the &F command.
	&W1	Clears user default settings from nonvolatile memory and causes the factory defaults to be loaded at power-on or following the ATZ command.
Command:	&Zn=x	Store Dialing Command
Values:	$n = 0\text{--}3$ (callback security disabled) or $0\text{--}29$ (callback security enabled)	
	x = Dialing command string	
Default:	None	
Description:	Stores dialing command x in memory location y. Dial the stored number using the command ATDS=n . See also the #CBSn command. For callback security options, see Chapter 6.	
Command:	\An	Select Maximum MNP Block Size
Values:	$n = 0, 1, 2,$ or 3	
Default:	3	
Description:	\A0	64-character maximum.
	\A1	128-character maximum.
	\A2	192-character maximum.
	\A3	256-character maximum.

Command: **\Bn** **Transmit Break**
 Values: $n = 0\text{--}9$ in 100 ms units
 Default: 3
 Description: In non-error-correction mode only, sends a break signal of the specified length to a remote modem. Works in conjunction with the **\K** command.

Command: **\Kn** **Break Control**
 Values: $n = 0\text{--}5$
 Default: 5
 Description: Controls the response of the modem to a break received from the computer, the remote modem, or the **\B** command. The response is different for each of three different states.

Data mode. The modem receives the break from the computer:

- \K0 Enters online command mode, no break sent to the remote modem.
- \K1 Clears data buffers and send break to the remote modem.
- \K2 Same as **\K0**.
- \K3 Sends break immediately to the remote modem .
- \K4 Same as **\K0**.
- \K5 Sends break to the remote modem in sequence with the transmitted data.

Data mode. The modem receives the break from the remote modem:

- \K0 Clears data buffers and sends break to the computer.
- \K1 Same as **\K0**.
- \K2 Sends break immediately to the computer.
- \K3 Same as **\K2**.
- \K4 Sends break to the computer in sequence with the received data.
- \K5 Same as **\K4**.

Online command mode. The modem receives a **\Bn** command from the computer:

- \K0 Clears data buffers and sends break to the remote modem.
- \K1 Same as **\K0**.
- \K2 Sends break immediately to the remote modem.
- \K3 Same as **\K2**.
- \K4 Sends break to the remote modem in sequence with the transmitted data.
- \K5 Same as **\K4**.

Command:	\Nn	Error Correction Mode Selection
Values:	$n = 0\text{--}5, \text{ or } 7$	
Default:	3	
Description:	\N0	Non-error correction mode with data buffering (buffer mode; same as &Q6).
	\N1	Direct mode.
	\N2	MNP reliable mode. If the modem cannot make an MNP connection, it disconnects.
	\N3	V.42/MNP auto-reliable mode. The modem attempts first to connect in V.42 error correction mode, then in MNP mode, and finally in non-error-correction (buffer) mode with continued operation.
	\N4	V.42 reliable mode. If the modem cannot make a V.42 connection, it disconnects.
	\N5	V.42, MNP, or non-error correction (same as \N3).
	\N7	V.42, MNP, or non-error correction (same as \N3).

Command:	\Qn	Flow Control Selection
Values:	$n = 0, 1, \text{ or } 3$	
Default:	3	
Description:	\Q0	Disables flow control (same as &K0).
	\Q1	XON/XOFF software flow control (same as &K4).
	\Q2	CTS-only flow control. Not supported.
	\Q3	RTS/CTS hardware flow control (same as &K3).

Command:	\Tn	Inactivity Timer
Values:	$n = 0, 1\text{--}255$	
Default:	0	
Description:	\Tn	Sets the time (in minutes) that the modem waits after the last character is sent or received before it disconnects. A value of zero disables the timer. Applies only in buffer mode.

Note: You can also set the inactivity timer by changing the value of **S30**.

Command:	\Vn	Protocol Result Code
Values:	$n = 0, 1, \text{ or } 2$	
Default:	1	
Description:	\V0	Disables the appending of the protocol result code to the DCE speed.
	\V1	Enables the appending of the protocol result code to the DCE speed.
	\V2	Same as \V1.

Command:	\Xn	XON/XOFF Pass-Through
Values:	$n = 0 \text{ or } 1$	
Default:	0	
Description:	\X0	Modem responds to and discards XON/XOFF characters.
	\X1	Modem responds to and passes XON/XOFF characters.

Command:	-Cn	Data Calling Tone
Values:	$n = 0 \text{ or } 1$	
Defaults:	0	
Description:	-C0	Disables V.25 data calling tone to deny remote data/fax/voice discrimination.
	-C1	Enables V.25 data calling tone to allow remote data/fax/voice discrimination.
Command:	%A	Adaptive Answer Result Code Enable
Values:	$n = 0 \text{ or } 1$	
Default:	0	
Description:		The %A command controls whether the <i>DATA</i> and <i>FAX</i> result codes will be sent by the modem. The modem must be in fax mode for this command to work. Also, the modem must be set to +FAA=1 , which enables the modem to distinguish between a fax and a data call. When these commands are enabled, the modem sends <i>DATA</i> to the computer when it detects data tones, and <i>FAX</i> when it detects fax tones. These strings are used by some servers to select the appropriate communication program.
	%A0	Disables adaptive answer result codes.
	%A1	Enables adaptive answer result codes.

Note: For descriptions of the **+FAA=** and other fax commands, see the Multi-Tech Fax Class 2.1 Developer's Guide.

Command:	%B	View Numbers in Blacklist
Values:	n/a	
Description:		If blacklisting is in effect, AT%B displays the numbers for which the last call attempted in the previous two hours failed. In countries that do not require blacklisting, the <i>ERROR</i> result code appears.

Command:	%Cn	Data Compression Control
Values:	$n = 0 \text{ or } 1$	
Default:	1	
Description:	%C0	Disable sV.42bis/MNP 5 data compression.
	%C1	Enables V.42bis/MNP 5 data compression.

Command:	%DCn	AT Command Control
Values:	$n = 0 \text{ or } 1$	
Default:	0	
Description:	%DC0	The modem responds to AT commands.
	%DC1	The modem ignores AT commands.

Note: The modem will respond to **AT%DC** for 10 seconds after it is turned on.

Command:	%En	Fallback and Fall Forward Control
Values:	$n = 0, 1, \text{ or } 2$	
Default:	2	
Description:	%E0	Disables fallback and fall-forward.
	%E1	Enables fallback, disables fall-forward.
	%E2	Enables fallback and fall-forward.

Command:	%Hn Direct Connect Enable
Values:	$n = 0, 1$
Default:	0
Description:	%H0 Sets callback security to normal operation. %H1 All callback security calls will be direct connect regardless of whether the password or phone number has the - character.
Command:	%Rn Cisco Configuration
Values:	$n = 0, 1$
Default:	0
Description:	%R0 Disables Cisco configuration. %R1 Sets E0, Q1, &D0, \N0, \$SB9600 , and %S1 for operation with a Cisco router.
Command:	%Sn Command Speed Response
Values:	$n = 0, 1$
Default:	0
Description:	%S0 Sets modem to respond to AT commands at all normal speeds. %S1 AT commands accepted at 115200 bps only. AT commands at other speeds are ignored.
Command:	\$Dn DTR Dialing
Values:	$n = 0 \text{ or } 1$
Default:	0
Description:	\$D0 Disables DTR dialing. \$D1 Dials the number in memory location 0 when DTR goes high.
Command:	\$EBn Asynchronous Word Length
Values:	$n = 0 \text{ or } 1$
Default:	0
Description:	\$EB0 Enables 10-bit mode. \$EB1 Enables 11-bit mode.
Command:	\$SBn Serial Port Baud Rate
Values:	$n = \text{speed in bits per second}$
Default:	57600
Description:	\$SB300 Set serial port to 300 bps. \$SB1200 Set serial port to 1200 bps. \$SB2400 Set serial port to 2400 bps. \$SB4800 Set serial port to 4800 bps. \$SB9600 Set serial port to 9600 bps. \$SB19200 Set serial port to 19200 bps. \$SB38400 Set serial port to 38400 bps. \$SB57600 Set serial port to 57600 bps. \$SB115200 Set serial port to 115200 bps.

Command: +DCS=x,y Select V.44 Data Compression

Values:	$x = 0$ or 1 (V.42bis)
	$y = 0, 1,$ or 2 (V.44)
Default:	1, 2
Description:	Selects V.42bis/V.44 data compression.
+DCS=0,0	V.42bis and V.44 data compression are both disabled.
+DCS=0,1	V.42bis is disabled; V.44 data compression is acceptable.
+DCS=0,2	V.42bis is disabled; V.44 only when connected to a V.92 server.
+DCS=1,0	V.42bis is acceptable; V.44 data compression is disabled.
+DCS=1,1	V.42bis is acceptable; V.44 data compression is acceptable.
+DCS=1,2	V.42bis is acceptable; V.44 only when connected to a V.92 server.
+DCS=?	Displays the allowed values.
+DCS?	Displays the current value.

Command: +DR=n V.44 Data Compression Reporting

Values:	$n = 0$ or 1
Default:	0
Description:	Enables or disables the V.44 data compression report. If the compression report is enabled, the +DR:<type> intermediate result code reports the current DCE-DCE data compression type. It is issued after the Error Control Report (+ER) and before the final result code (e.g., <i>CONNECT</i>). The intermediate result code descriptions are shown after the command descriptions.
+DR=0	Disables the V.44 compression report.
+DR=1	Enables the V.44 compression report.
+DR=?	Displays the allowed values.
+DR?	Displays the current value.
+DR: NONE	Data compression not in use.
+DR: V42B	V.42bis is in use in both directions.
+DR: V44	V.44 is in use in both directions.

Command: +DS44=n V.44 Data Compression

Values:	See description
Default:	See description
Description:	Controls the V.44 data compression function. The command syntax is +DS44=[direction][,[0][,[0] [,[max_codewords_tx][,[max_codewords_rx][,[max_string_tx] [,[max_string_rx][,[max_history_tx][,[max_history_rx]]]]]]]]<CR> Subparameters that are not entered retain their current value. Commas separate optional subparameters, and must be inserted to skip a subparameter. Example: +DS44=,,,2048,2048<CR> changes the maximum number of code words in both directions, and keeps all other settings at their current values.
+DS44=?	Reports supported options in the format (list of supported <i>direction</i> values), (0), (0), (list of supported <i>max_codewords_tx</i> values), (list of supported <i>max_codewords_rx</i> values), (list of supported <i>max_string_tx</i> values), (list of supported <i>max_string_rx</i> values), (list of supported <i>max_history_tx</i> values), (list of supported <i>max_history_rx</i> values). Example: +DS44: (3, 0), (0), (0), (256-2048), (256-2048), (31-255), (31-255), (512-11008), (512-11008).

+DS44? Reports current options in the following format:
direction, 0, 0, *max_codewords_tx*, *max_codewords_rx*,
max_string_tx, *max_string_rx*, *max_history_tx*, *max_history_rx*.
Example: +DS44: 3, 0, 0, 1024, 1024, 255, 255, 5120, 4096.

Subparameters

<i>direction</i>	Specifies the DTE direction of the data compression.
0	No compression.
3	Compression in both directions (default).
<i>max_codewords_tx</i>	Specifies the maximum number of code words to be negotiated in the transmit direction.
1024	Default.
256–2048	Maximum number of code words in transmit direction.
<i>max_codewords_rx</i>	Specifies the maximum number of code words to be negotiated in the receive direction.
1024	Default.
256–2048	Maximum number of code words in receive direction.
<i>max_string_tx</i>	Specifies the maximum string length to be negotiated in the transmit direction.
255	Default.
31–255	Maximum string length in transmit direction.
<i>max_string_rx</i>	Specifies the maximum string length to be negotiated in the receivedirection.
255	Default.
31–255	Maximum string length in receivedirection.
<i>max_history_tx</i>	Specifies the maximum length of the history buffer to be negotiated in the transmit direction.
5120	Default.
512–11008	History buffer size in transmit direction.
<i>max_history_rx</i>	Specifies the maximum length of the history buffer to be negotiated in the receive direction.
4096	Default.
512–11008	History buffer size in receive direction.

Command: **+ES=n Enable Synchronous Buffered Mode**

Values: *n* = 6

Default: None

Description: Allows an H.324 video application direct access to the synchronous data channel. On underflow, the modem sends HDLC flag idle (0x7E) to the remote modem.. This special error control mode is overridden by any of the following commands: **&F**, **&M**, **&Q**, or **\N**.

+ES=6 Enables direct access to the synchronous data channel.

+ES=? Displays the allowed values.

+ES? Displays the current value.

Command: **+MS= Modulation Selection**
 Values: See description.
 Defaults: See description.
 Description: This extended-format command selects modulation, enables or disables automode, and specifies the highest downstream and upstream connection rates using one to four subparameters.

The command syntax is

+MS=[mod][,[automode][,[0][,[max_rate][,[0][,[max_rx_rate]]]]]]<CR>

Subparameters that are not entered retain their current value.

Commas separate optional subparameters, and must be inserted to skip a subparameter. Example: **+MS=,0<CR>** disables automode and keeps all other settings at their current values.

+MS=? Reports supported options in the format (list of supported *mod* values),(list of supported *automode* values),(0),(list of supported *max_rate* values),(0),(list of supported *max_rx_rate* values). Example: **+MS: (BELL103, V21, BELL212A, V22, V22B, V23C, V32, V32B, V34, V90, V92), (0, 1), (0), (0-33600), (0), (0-56000)**

+MS? Reports current options in the format *mod, automode, 0, max_rate, 0, max_rx_rate*. Example: **+MS: V92, 1, 0, 31200, 0, 56000.**

Subparameters

mod Specifies the preferred modulation (automode enabled) or the modulation to use in originating or answering a connection (automode disabled). The default is V92.

<i>mod</i>	Modulation	Possible rates (bps) ¹
V92 ²	V.92	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333. 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, or 28000
V90 ³	V.90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 44000, 42667, 41333. 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, or 28000
V34	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400
V32B	V.32bis	14400, 12000, 9600, 7200, or 4800
V32	V.32	9600 or 4800
V22B	V.22bis	2400 or 1200
V22	V.22	1200
V23C	V.23	1200
V21	V.21	300
Bell212A	Bell 212A	1200
Bell103	Bell 103	300

Notes:

1. See optional *<automode>*, *<max_rate>*, and *<max_RX_rate>* subparameters.
2. Selects V.92 modulation as first priority. If a V.92 connection cannot be established, the modem attempts V.90, V.34, V.32bis, etc.
3. Selects V.90 modulation as first priority. If a V.90 connection cannot be established, the modem attempts V.34, V.32bis, etc.

automode An optional numeric value that enables or disables automatic modulation negotiation using V.8 bis/V.8 or V.32 bis Annex A. Automode is disabled if values are specified for the *max_rate* and *max_rx_rate* parameters. The options are:

- 0 Disable automode
- 1 Enable automode (default)

max_rate An optional number that specifies the highest rate at which the modem may establish an upstream (transmit) connection. The value is decimal coded in units of bps, for example, 33600 specifies the highest rate to be 33600 bps.

- 0 Maximum rate determined by the modulation selected in *mod* (default).

300–33600 Maximum rate value limited by the modulation selected in *mod*. For valid *max_rate* values for each *mod* value, see the following table.

<i>mod</i> value	Valid <i>max_rate</i> values (bps)
V92, V90, V34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400
V32B	19200, 16800, 14400, 12000, 9600, 7200, 4800
V32	14400, 12000, 9600, 7200, 4800
V22B	2400
V22, V23C, Bell212A	1200
V21, Bell103	300

max_rx_rate An optional number that specifies the highest rate at which the modem may establish a downstream (receive) connection. The value is decimal coded in units of bps, e.g., 28800 specifies the highest rate to be 28800 bps.

- 0 Maximum rate determined by the modulation selected in *mod* (default).

300–56000 Maximum rate value limited by the modulation selected in *mod*. See “Possible rates” in the *mod* table.

Command: +PCW=*n* Call Waiting Enable

Values: *n* = 0, 1, or 2

Default: 2

Description: Controls the action to be taken upon detection of a call waiting tone in V.92 mode. Values specified by this command are not modified when an **AT&F** command is issued.

- +PCW=0 Toggles V.24 Circuit 125 and collects Caller ID if enabled by +VCID
- +PCW=1 Hangs up
- +PCW=2 Ignores V.92 call waiting
- +PCW=? Displays the allowed values
- +PCW? Displays the current value

Command: **+PIG=n** **PCM Upstream Ignore**
 Values: $n = 0 \text{ or } 1$
 Default: 1
 Description: Controls the use of PCM upstream during V.92 operation. PCM upstream allows faster upload speeds to a V.92 server.

- +PIG=0 Disables PCM upstream
- +PIG=1 Enables PCM upstream
- +PIG=? Displays the allowed values
- +PIG? Displays the current value

Command: **+PMH=n** **Modem on Hold Enable**
 Values: $n = 0 \text{ or } 1$
 Default: 1
 Description: Controls if modem on hold procedures are enabled during V.92 operation. Normally controlled by a modem on hold program. Values specified by this command are not modified when an **AT&F** command is issued.

- +PMH=0 Enables V.92 modem on hold
- +PMH=1 Disables V.92 modem on hold
- +PMH=? Displays the allowed values
- +PMH? Displays the current value

Command: **+PMHF** **V.92 Modem Hook Flash**
 Values: n/a
 Default: n/a
 Description: Causes the DCE to go on-hook for a specified period of time, and then return off-hook for at least a specified period of time. The specified period of time is normally one-half second, but may be governed by national regulations. “ERROR” is returned if MOH is not enabled.

Command: **+PMHR=n** **Modem on Hold Initiate**
 Values: $n = 0\text{--}13$
 Default: 0
 Description: **+PMHR** is an action command that causes the modem to initiate MOH with the central site modem. It returns the following values to indicate what has been negotiated. Valid only if MOH is enabled and the modem is off-hook or in data mode. Otherwise, *ERROR* will be returned.

- +PMHR=0 Deny MOH request
- +PMHR=1 Grant MOH request with 10 second timeout
- +PMHR=2 Grant MOH request with 20 second timeout
- +PMHR=3 Grant MOH request with 30 second timeout
- +PMHR=4 Grant MOH request with 40 second timeout
- +PMHR=5 Grant MOH request with 1 minute timeout
- +PMHR=6 Grant MOH request with 2 minute timeout
- +PMHR=7 Grant MOH request with 3 minute timeout
- +PMHR=8 Grant MOH request with 4 minute timeout
- +PMHR=9 Grant MOH request with 6 minute timeout
- +PMHR=10 Grant MOH request with 8 minute timeout

+PMHR=11	Grant MOH request with 12 minute timeout
+PMHR=12	Grant MOH request with 16 minute timeout
+PMHR=13	Grant MOH request with indefinite timeout
+PMHR=?	Displays the allowed values
+PMHR?	Displays the current value

Command: +PMHT=*n* Modem on Hold Timer

Values: *n* = 0–13
 Default: 0
 Description: Determines if the modem will accept a V.92 Modem on Hold (MOH) request and will set the MoH timeout.

+PMHT=0	Deny MOH request
+PMHT=1	Grant MOH request with 10 second timeout
+PMHT=2	Grant MOH request with 20 second timeout
+PMHT=3	Grant MOH request with 30 second timeout
+PMHT=4	Grant MOH request with 40 second timeout
+PMHT=5	Grant MOH request with 1 minute timeout
+PMHT=6	Grant MOH request with 2 minute timeout
+PMHT=7	Grant MOH request with 3 minute timeout
+PMHT=8	Grant MOH request with 4 minute timeout
+PMHT=9	Grant MOH request with 6 minute timeout
+PMHT=10	Grant MOH request with 8 minute timeout
+PMHT=11	Grant MOH request with 12 minute timeout
+PMHT=12	Grant MOH request with 16 minute timeout
+PMHT=13	Grant MOH request with indefinite timeout
+PMHT=?	Displays the allowed values
+PMHT?	Displays the current value

Command: +PQC=*n* Quick Connect Control

Values: *n* = 0, 1, 2, or 3
 Default: 3
 Description: Controls the V.92 shortened Phase 1 and Phase 2 startup procedures (Quick Connect). When line conditions are stable, quick connect results in shortened connect times; however, significant fluctuation in line conditions from call to call can result in longer connect times, in which case it may be advisable to disable quick connect. The **+PQC** command is interactive with **S109**.

+PQC=0	Enables Short Phase 1 and Short Phase 2 (Quick Connect)
+PQC=1	Enables Short Phase 1
+PQC=2	Enables Short Phase 2
+PQC=3	Disables Short Phase 1 and Short Phase 2
+PQC=?	Displays the allowed values
+PQC?	Displays the current value

Command: +VCID=n Caller ID Selection

Values:	$n = 0, 1, \text{ or } 2$
Default:	0
Description:	Enables Caller ID detection and configures the reporting and presentation of the Caller ID data that is detected after the first ring. The reported data includes the date and time of the call, the caller's name and number, and a message. Set S0=2.
+VCID=0	Disables Caller ID
+VCID=1	Enables Caller ID with formatted data
+VCID=2	Enables Caller ID with unformatted data
+VCID=?	Displays the allowed values
+VCID?	Displays the current value

Command: +VDR=x, y Distinctive Ring Report

Values:	$x = 0, 1$ <i>Distinctive Ring report control. See description.</i>
	$y = 0\text{--}255$ <i>Minimum ring interval in 100 ms units. See description.</i>

Default:	0, 0
Description:	Enables reporting of ring cadence information to the DTE and specifies the minimum ring cadence that will be reported.

The report format is one line per silence period and one line per ring period. The length of the silence period is in the form *DROF=number in units of 100 ms*<CR><LF>, and the length of the ring is in the form *DRON=number in units of 100 ms*<CR><LF>. The modem may produce a Ring event code after the DRON message if enabled by the *y* parameter. The *y* parameter must be set to a value equal to or smaller than the expected ring cadence in order to pass the report to the DTE.

+VDR=0, n/a	Disables Distinctive Ring cadence reporting.
+VDR=1, 0	Enables Distinctive Ring cadence reporting. Other call progress result codes (including RING) are reported as normal.
+VDR=1, >0	Enables Distinctive Ring cadence reporting. The RING result code is reported after the falling edge of the ring pulse (i.e., after the DRON report).
+VDR=?	Displays the allowed values.
+VDR?	Displays the current value.

Command: #CBA n Callback Attempts

Values:	$n = 1\text{--}255$
Default:	4
Description:	Sets the number of callback attempts that are allowed after passwords have been exchanged between modems..

Command: #CBD n Callback Delay

Values:	$n = 0\text{--}255$
Default:	15
Description:	Sets the length of time (in seconds) that the modem waits before calling back the remote modem.

Command: **#CBF?** **Callback Failed Attempts Display**
 Values: n/a
 Default: n/a
 Description: Requests the number of failed callback passwords since reset or power-up. This number can be stored to nonvolatile memory using the **&W** command.

Command: **#CBFR** **Callback Failed Attempts Reset**
 Values: n/a
 Default: n/a
 Description: Resets the number of failed callback passwords to 0. This does not reset the number stored in nonvolatile memory.

Command: **#CBI n** **Local Callback Inactivity Timer**
 Values: $n = 1\text{--}255$
 Default: 20
 Description: Sets the time (in minutes) that the modem waits for a command before forcing the user to enter the setup password again.

Command: **#CBNy=x** **Store Callback Password**
 Values: $y = 0\text{--}29$
 $x = \text{password}$
 Defaults: None
 Description: Sets the callback security password for the y memory location. The password must have 6 to 10 characters, and cannot include the + or - characters.

Command: **#CBP n** **Callback Parity**
 Values: $n = 0, 1, \text{ or } 2$
 Default: 0
 Description: Sets parity for the callback security messages.
#CBP0 No parity.
#CBP1 Odd parity.
#CBP2 Even parity.

Command: **#CBRy** **Callback Security Reset**
 Values: $y = 0\text{--}29$
 Default: None
 Description: Clears the password and phone number in the y memory location.

Command: **#CBS n** **Callback Enable/Disable**
 Values: $n = 0, 1, 2, \text{ or } 3$
 Default: 0
 Description: #CBS0 Disables callback security.
#CBS1 Enables local and remote callback security.
#CBS2 Enables remote callback security only.
#CBS3 Disables callback security until local hangup or reset.

Command: **#Pn Set 11-bit Parity**

Values: $n = 0 \text{ or } 1$

Default: 2

Description: #P0 No parity.

#P1 Odd parity.

#P2 Even parity.

Command: **#Sx Enter Setup Password**

Values: $x = \text{password (1-8 characters, case sensitive)}$

Default: MTSMODEM

Description: Enters the callback security setup password.

Command: **#S=x Store Setup Password**

Values: $x = \text{password (1-8 characters, case sensitive)}$

Default: MTSMODEM

Description: Stores a new callback security and remote configuration setup password.

Command: **+++AT<CR> Escape Sequence**

Values: n/a

Description: Puts the modem in command mode (and optionally issues a command) while remaining online. Type **+++AT** and up to six command characters, then press ENTER. Used mostly to issue the hang-up command: **+++ATH<CR>**.

Command: **%%%AT<CR> Remote Configuration Escape Sequence**

Values: n/a

Description: Initiates remote configuration mode while online with remote modem. The remote configuration escape character (%) is defined in register **S13**.

S-Registers

Certain modem values, or parameters, are stored in memory locations called *S-registers*. Use the **S** command to read or to alter the contents of S-registers (see previous section).

Register	Unit	Range	Default	Description
S0	1 ring	0–255	1	Sets the number of rings until the modem answers. ATS0=0 disables autoanswer completely. Range varies by country. Set S0=2 for Caller ID.
S1	1 ring	0–255	0	Counts the rings that have occurred.
S2	decimal	0–255	43 (+)	Sets ASCII code for the escape sequence character. Values greater than 127 disable escape.
S3	decimal	0–127	13 (^M)	Sets the ASCII code for the carriage return character.
S4	decimal	0–127	10 (^J)	Sets the ASCII code for line feed character.
S5	decimal	0–127	8 (^H)	Sets the ASCII code for the backspace character. Values over 32 disable it.
S6	seconds	2–65*	2*	Sets the time the modem waits after it goes off-hook before it begins to dial the telephone number.
S7	seconds	1–255*	50*	Sets the time the modem waits for a carrier signal before aborting a call. Also sets the wait-for-silence time for the @ dial modifier.
S8	seconds	2–65	2	Sets the length of a pause caused by a comma character in a dialing command.
S9	decimal	0–127	37 (%)	Sets ASCII code for remote configuration escape character. S9=0 disables remote configuration.
S10	100 ms	1–255	20	Sets how long a carrier signal must be lost before the modem disconnects.
S11	1 ms	50–150*	95*	Sets spacing and duration of dialing tones.
S18	50 ms	0–255	20	Sets the time the CD signal drops before going high again. Used for some PBX and CBX phone systems. See &C2 command.
S28	decimal	0, 1–255	1	0 disables, 1–255 enables V.34 modulation.
S30	1 minute	0, 1–255	0	Sets the time the modem waits before it disconnects when no data is sent or received. A value of zero disables the timer. See also the \T command
S35	decimal	0–1	0	0 disables, 1 enables the V.25 data calling tone, which allows remote data/fax/voice discrimination.

* These values may be different outside North America.

Register	Unit	Range	Default	Description
S36	decimal	0–7	7	Specifies the action to take in the event of a negotiation failure when error control is selected. (See S48 .)
S37	decimal	0–19	0	Sets the maximum V.34 “upstream” speed at which the modem attempts to connect.
				Value Speed
		0		maximum modem speed
		1		reserved
		2		1200/75 bps
		3		300 bps
		4		reserved
		5		1200 bps
		6		2400 bps
		7		4800 bps
		8		7200 bps
		9		9600 bps
		10		12000 bps
		11		14400 bps
		12		16800 bps
		13		19200 bps
		14		21600 bps
		15		24000 bps
		16		26400 bps
		17		28800 bps
		18		31200 bps
		19		33600 bps
S38	decimal	0–23	1	Sets the maximum 56K “downstream” speed at which the modem attempts to connect. The default maximum speed is 56K bps. Note: When using V.34 or V.32 client-to-client connections in poor conditions, setting S38=0 may result in better performance.
				Value Rate
		0		56K disabled
		1		56K autorate
		2		28000 bps
		3		29333 bps
		4		30666 bps
		5		32000 bps
		6		33333 bps
		7		34666 bps
		8		36000 bps
		9		37333 bps
		10		38666 bps
		11		40000 bps
		12		41333 bps
		13		42666 bps
		14		44000 bps
		15		45333 bps

Register	Unit	Range	Default	Description															
			16 17 18 19 20 21 22 23	46666 bps 48000 bps 49333 bps 50666 bps 52000 bps 53333 bps 54666 bps 56000 bps															
S42	decimal	0–1	1	Enables/disables the 56K auto rate. When 56K auto is disabled, fallback to V.34 is also disabled. 0 = disable; 1 = enable.															
S48	decimal	7 or 128	7	Enables (7) or disables (128) LAPM negotiation. The following table lists the S36 and S48 configuration settings for certain types of connections.															
				<table border="1"> <thead> <tr> <th></th><th>S48=7</th><th>S48=128</th></tr> </thead> <tbody> <tr> <td>S36=0, 2</td><td>LAPM or hangup</td><td>Do not use</td></tr> <tr> <td>S36=1, 3</td><td>LAPM or async</td><td>Async</td></tr> <tr> <td>S36=4, 6</td><td>LAPM, MNP, or hangup</td><td>MNP or hangup</td></tr> <tr> <td>S36=5, 7</td><td>LAPM, MNP, or aysnc</td><td>MNP or aysnc</td></tr> </tbody> </table>		S48=7	S48=128	S36=0, 2	LAPM or hangup	Do not use	S36=1, 3	LAPM or async	Async	S36=4, 6	LAPM, MNP, or hangup	MNP or hangup	S36=5, 7	LAPM, MNP, or aysnc	MNP or aysnc
	S48=7	S48=128																	
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S36=4, 6	LAPM, MNP, or hangup	MNP or hangup																	
S36=5, 7	LAPM, MNP, or aysnc	MNP or aysnc																	
S89	seconds	0, 5–255	0	Sets the length of time in the off-line command mode before the modem goes into standby mode. A value of zero prevents standby mode; a value of 1–4 sets the value to 5.															
S108	decimal	0–3, 6, 7	6	Selects the 56K digital loss if using the modem thru a PBX line. The default value is -6 dB loss, the value used when calling from a typical POTS line long distance.															
				Value Digital loss <table> <tr> <td>0</td><td>-0 dB digital loss, no robbed-bit signaling</td></tr> <tr> <td>1</td><td>-3 dB PBX digital loss</td></tr> <tr> <td>2</td><td>-2 dB digital loss</td></tr> <tr> <td>3</td><td>-3 dB digital loss</td></tr> <tr> <td>6</td><td>-6 dB digital loss</td></tr> <tr> <td>7</td><td>-0 dB digital loss with robbed-bit signaling</td></tr> </table>	0	-0 dB digital loss, no robbed-bit signaling	1	-3 dB PBX digital loss	2	-2 dB digital loss	3	-3 dB digital loss	6	-6 dB digital loss	7	-0 dB digital loss with robbed-bit signaling			
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7	-0 dB digital loss with robbed-bit signaling																		

Result Codes

In command mode your modem can send responses called *result codes* to your computer. Result codes are used by communications programs and can also appear on your monitor.

Terse	Verbose	Description
0	<i>OK</i>	Command executed
1	<i>CONNECT</i>	Modem connected to line
2	<i>RING</i>	Ring signal detected
3	<i>NO CARRIER</i>	Carrier signal lost or not detected
4	<i>ERROR</i>	Invalid command
5	<i>CONNECT 1200</i> *	Connected at 1200 bps
6	<i>NO DIALTONE</i>	No dial tone detected
7	<i>BUSY</i>	Busy signal detected
8	<i>NO ANSWER</i>	No answer at remote end
10	<i>CONNECT 2400</i> *	Connected at 2400 bps
11	<i>CONNECT 4800</i> *	Connected at 4800 bps
12	<i>CONNECT 9600</i> *	Connected at 9600 bps
13	<i>CONNECT 14400</i> *	Connected at 14400 bps
14	<i>CONNECT 19200</i> *	Connected at 19200 bps
24	<i>CONNECT 7200</i> *	Connected at 7200 bps
25	<i>CONNECT 12000</i> *	Connected at 12000 bps
26	<i>CONNECT 16800</i> *	Connected at 16800 bps
40	<i>CONNECT 300</i> *	Connected at 300 bps
55	<i>CONNECT 21600</i> *	Connected at 21600 bps
56	<i>CONNECT 24000</i> *	Connected at 24000 bps
57	<i>CONNECT 26400</i> *	Connected at 26400 bps
58	<i>CONNECT 28800</i> *	Connected at 28800 bps
59	<i>CONNECT 31200</i> *	Connected at 31200 bps
60	<i>CONNECT 33600</i> *	Connected at 33600 bps
70	<i>CONNECT 32000</i> *	Connected at 32000 bps, 56K rate
71	<i>CONNECT 34000</i> *	Connected at 34000 bps, 56K rate
72	<i>CONNECT 36000</i> *	Connected at 36000 bps, 56K rate
73	<i>CONNECT 38000</i> *	Connected at 38000 bps, 56K rate
74	<i>CONNECT 40000</i> *	Connected at 40000 bps, 56K rate
75	<i>CONNECT 42000</i> *	Connected at 42000 bps, 56K rate
76	<i>CONNECT 44000</i> *	Connected at 44000 bps, 56K rate
77	<i>CONNECT 46000</i> *	Connected at 46000 bps, 56K rate
78	<i>CONNECT 48000</i> *	Connected at 48000 bps, 56K rate
79	<i>CONNECT 50000</i> *	Connected at 50000 bps, 56K rate
80	<i>CONNECT 52000</i> *	Connected at 52000 bps, 56K rate
81	<i>CONNECT 54000</i> *	Connected at 54000 bps, 56K rate
82	<i>CONNECT 56000</i> *	Connected at 56000 bps, 56K rate
88	<i>DELAYED</i>	Delay is in effect for the dialed number
89	<i>BLACKLISTED</i>	Dialed number is blacklisted

* When the extended result code configuration option is enabled, one of the following codes is appended to the result code, depending on the type of error control connection:

V42bis – V.42 error control (LAP-M) and V.42bis data compression

V42 – V.42 error control (LAP-M) only

MNP5 – MNP 4 error control and MNP 5 data compression

MNP4 – MNP 4 error control only

NoEC – No error control protocol

Terse	Verbose	Description
90	<i>BLACKLIST FULL</i>	Blacklist is full
100	<i>CONNECT 28000 *</i>	Connected at 28000 bps, 56K rate
101	<i>CONNECT 29333 *</i>	Connected at 29333 bps, 56K rate
102	<i>CONNECT 30666 *</i>	Connected at 30666 bps, 56K rate
103	<i>CONNECT 33333 *</i>	Connected at 33333 bps, 56K rate
104	<i>CONNECT 34666 *</i>	Connected at 34666 bps, 56K rate
105	<i>CONNECT 37333 *</i>	Connected at 37333 bps, 56K rate
106	<i>CONNECT 38666 *</i>	Connected at 38666 bps, 56K rate
107	<i>CONNECT 41333 *</i>	Connected at 41333 bps, 56K rate
108	<i>CONNECT 42666 *</i>	Connected at 42666 bps, 56K rate
109	<i>CONNECT 45333 *</i>	Connected at 45333 bps, 56K rate
110	<i>CONNECT 46666 *</i>	Connected at 46666 bps, 56K rate
111	<i>CONNECT 49333 *</i>	Connected at 49333 bps, 56K rate
112	<i>CONNECT 50666 *</i>	Connected at 50666 bps, 56K rate
113	<i>CONNECT 53333 *</i>	Connected at 53333 bps, 56K rate
114	<i>CONNECT 54666 *</i>	Connected at 54666 bps, 56K rate
115	<i>CONNECT 25333 *</i>	Connected at 25333 bps, 56K rate
116	<i>CONNECT 26666 *</i>	Connected at 26666 bps, 56K rate

* When the extended result code configuration option is enabled, one of the following codes is appended to the result code, depending on the type of error control connection:

V42bis – V.42 error control (LAP-M) and V.42bis data compression

V42 – V.42 error control (LAP-M) only

MNP5 – MNP 4 error control and MNP 5 data compression

MNP4 – MNP 4 error control only

NoEC – No error control protocol

Chapter 5

Remote Configuration

Chapter 5 - Remote Configuration

Remote configuration is a network management tool that allows you to configure MT5634ZBA modems anywhere in your network from one location. With password-protected remote configuration, you can issue **AT** commands to a remote modem for maintenance or troubleshooting as if you were on site.

Basic Procedure

The following steps are valid regardless of whether the connection is established by the local or the remote Multi-Tech modem.

Note: For this procedure, the remote computer must be running, and a communication program must be ready for a data connection, which will be indicated by a lighted **TR** indicator on the front of the modem.

1. Establish a data connection with a remote MT5634ZBA modem.
2. Send three remote configuration escape characters followed by **AT** and the setup password, and press **ENTER**. Example: **%%%ATM**TSMODEM****. You have four tries to enter the correct password before being disconnected. If the password is correct, the remote modem responds with **OK**.
3. Type **AT** commands to configure the remote modem.
4. When you have finished configuring the remote modem, save the new configuration by typing **AT&W0** and pressing **ENTER**.
5. Type **ATO** and press **ENTER** to exit remote configuration. You can now break the connection in the normal way.

CAUTION: If you hang up while you are in remote configuration mode, the modem may lock up.

Setup

Multi-Tech modems are shipped with a default setup password (MTSMODEM). Because anyone who has the *User Guide* knows the default setup password, you should change the password and possibly also the remote configuration escape character.

To Change the Setup Password

1. Open a data communications program such as HyperTerminal or PhoneTools.
2. In the terminal window, type **AT#SMTSMODEM** (or **AT#Sxxxxxxx** if you have replaced the MTSMODEM password with **xxxxxxx**) and press **ENTER**. The modem responds with **OK** if the setup password is correct, and **ERROR** if it is wrong.
3. To change the password, type **AT#S=xxxxxxxx**, where **xxxxxxxx** stands for the password, and then press **ENTER**. The password can include any keyboard character, and can be up to eight characters long. The modem responds with **OK**.

CAUTION: Passwords are case-sensitive. The next time you enter the password, it must be in the same case as you set it up.

4. The new password is saved automatically. You can now either enter more AT commands or exit the data communications program. The next time you wish to set up the modem, you must use the new password.

To Change the Remote Escape Character

To further improve security, you can change a remote modem's remote configuration escape character either locally or remotely. The remote configuration escape character is stored in register **S9**. The factory default is 37, which is the ASCII code for the percent character (%). Setting **S9** to 0 (zero) disables remote configuration entirely.

CAUTION: If you do this remotely, you won't be able to change it back remotely.

1. Establish a remote configuration link with the remote modem as described in "Basic Procedure."
2. Type **ATS9=n**, where *n* is the ASCII code for the new remote configuration escape character, and then press **ENTER**.
3. Save the new value by typing **AT&W** and pressing **ENTER**.
4. Type **ATO** and press **ENTER** to exit remote configuration.

Chapter 6

Callback Security

Chapter 6 - Callback Security

This chapter describes how to use callback security with your modem.

Callback security protects your network from unauthorized access and helps control long-distance costs. When callback security is enabled, all callers are requested to enter a password. If a valid password is received, the modem hangs up and returns the call by dialing a phone number that is stored with the password. The person being called back must then enter the password a second time to establish a connection.

Up to 30 callback passwords and dialing strings can be stored in the modem. Each dialing string can be up to 34 or 35 characters long and can contain commands as well as phone numbers. For mobile callers, the dialing string can be programmed to allow the caller to bypass the stored callback number by entering a temporary callback number, to enter an extension at the callback number, or to make a direct connection without callback.

For local security, the passwords and dialing strings that are stored in the modem are protected from tampering by a setup password, which you should change when you set up the modem. You can further protect the modem against tampering by disabling its ability to respond to most AT commands. To check for attempted break-ins, you can request the modem to display the number of failed password attempts.

Setup

Your modem was shipped with a default setup password (MTSMODEM). The same password is used for both callback security and remote configuration (Chapter 5). Because anyone who has access to this guide has access to the default password, you should change the password during your initial setup.

To Change the Setup Password

1. Open a data communications program such as HyperTerminal or PhoneTools.
2. In the terminal window, type **AT#SMTSMODEM** (or **AT#Sxxxxxxxx** if you have replaced the MTSMODEM password with **xxxxxxxx**) and press **ENTER**. The modem responds with *OK* if the setup password is correct, and *ERROR* if it is wrong.
3. To change the password, type **AT#S=xxxxxxxx**, where **xxxxxxxx** stands for the password, and then press **ENTER**. The password can include any keyboard character, and can be up to eight characters long. The modem responds with *OK*.
4. The new password is saved automatically. You can now either enter more AT commands or exit the data communications program. The next time you wish to set up the modem, you must use the new password.

CAUTION: Passwords are case-sensitive. The next time you enter the password, it must be in the same case as you set it up.

To Turn Callback Security On and Off

Callback security must be turned on to enter many callback security commands.

1. Open a data communications program such as HyperTerminal or PhoneTools.
2. In the terminal window, type **AT#Sxxxxxxx**, where **xxxxxxx** is your password, and press ENTER. The modem responds with *OK* if the setup password is correct, and *ERROR* if it is wrong.
3. Type one of the following commands:
 - To turn off callback security, type **AT#CBS0** and press ENTER. Callers no longer need a password to connect to the modem, the modem is unable to call them back, and the stored dialing command locations 0–3 become available.
 - To turn on both local and remote callback security, type **AT#CBS1** and press ENTER. With local security turned on, you must enter the setup password before you can enter any **AT** command except the **AT**, **ATIn**, and **AT#Sxxxxxxx** commands. For a description of remote callback security, see the following paragraph.
 - To turn on remote callback security only, type **AT#CBS2** and press ENTER. With remote callback security turned on, each caller is asked to enter a password, is called back, and then is asked to enter the password again before a connection can be made. Also, dialing command locations 0–3, for use with the **DS=y** dialing command, are replaced by callback dialing command locations 0–29.
 - To temporarily disable callback security if the modem is set to **#CBS1** or **#CBS2** (for instance, to call another modem), type **AT#CBS3** and press ENTER. The modem returns to its original setting when you issue the hangup command (**+++ATH**) or the modem is reset. Note that if a remote modem breaks the connection, callback security remains disabled.

To Set the Parity of the Callback Security Messages

The parity of the modem's password prompt and messages must match the parity of the computer the modem is connected to.

1. Open a data communications program such as HyperTerminal or PhoneTools.
2. In the terminal window, type **AT#Sxxxxxxx**, where **xxxxxxx** is your password, and then press ENTER. The modem responds with *OK* if the setup password is correct, and *ERROR* if it is wrong.
3. The default parity value for your modem is no parity (**AT#CBP0**). To change the modem's prompt messages to use even parity, type **AT#CBP2** and press ENTER. For odd parity, type **AT#CBP1** and press ENTER.
4. To store the new parity value, type **AT&W**, and press ENTER.

To Assign Callback Passwords and Phone Numbers

1. Open a data communications program such as HyperTerminal or PhoneTools.
2. In the terminal window, type **AT#Sxxxxxxxx**, where xxxxxxxx is your password, and press ENTER. The modem responds with *OK* if the setup password is correct, and *ERROR* if it is wrong.
3. Enable callback security by typing **AT#CBS1** or **AT#CBS2** and pressing ENTER.
4. To store a callback password for the first callback memory location, type **AT#CBN0=xxxxxxxx**, where xxxxxxxx is the first password, and press ENTER. The password must be unique, must be six to eight characters, in length, and must not contain a + or - character.
5. To store a callback password for the second callback memory location, type **AT#CBN1=xxxxxxxx**, where xxxxxxxx is the second password, and press ENTER. Note that the memory location number in the command is incremented by one.
6. Repeat as many times as necessary, up to memory location 29, until all passwords have been entered.
7. To store a callback phone number in the first memory location, type **AT&Z0=[+][-]
]ATxxxxxxxx[,???**, where xxxxxxxx is the dialing string, and press ENTER. The phone number must be preceded by **DT**, for tone dialing, or **DP**, for pulse dialing. The dialing string can also include other AT commands. Example: **AT&Z0=+-ATM0DT5551212**. Up to 35 characters can be used. The +, -, and ??? characters are optional:
 - + Number entry. Add if you want a mobile caller to be able to enter his current phone number for callback.
 - Direct connection. Add if you want a caller to be able to choose to connect directly without being called back.
 - ,??? Extension entry. Must be used with the + command. Add if you want a caller to be able to enter an extension number for callback. The number of ? characters should equal the number of digits in the extension.
8. To store a callback phone number in the second memory location, type **AT&Z1=[+][-]
]ATxxxxxxxx[,???**, where xxxxxxxx is the dialing string, and press ENTER. Note that the memory location number in the command is incremented by one.
9. Repeat as many times as necessary, through memory location 29, until all dialing strings have been entered.
10. To review your entries, type **AT&V** and press ENTER.

Note: A form is provided on the last page of this chapter to help you plan or keep track of password and phone number assignments.

Calling Procedures

Use the following procedures to call a modem that has callback security enabled.

Note: Autoanswer must be enabled on the calling modem (**S0=1**).

Password-Only Callback

Use this procedure when calling from a fixed location.

1. Using a data communications program such as HyperTerminal or PhoneTools, dial the number of the callback modem.
2. When the connection is established, the callback modem responds with the following message:

Password>

3. Type the password corresponding to the phone number for your modem, and press **ENTER**. You have three attempts or one minute to enter a valid password.
4. If the password is valid, the following message appears, and the modems disconnect:
OK Disconnecting
5. After the delay specified by the **#CBDn** command, the callback modem calls the number associated with the password. If the callback modem is unable to establish a connection, it tries again, up to the number of attempts specified by the **#CBA**n command.
6. After the modems reconnect, the following message reappears:

Password>

7. Type the same password that you used to initiate the call. You have three attempts to enter the password or be disconnected.
8. If the password is valid, the following message appears and the modems establish a working connection:
OK Connecting

Number-Entry Callback

Mobile callers should use this procedure when calling from a phone number different from that stored with the password. The password that is used must be set up for optional number-entry callback.

1. Using a data communications program such as HyperTerminal or PhoneTools, dial the number of the callback modem.
2. When the connection is established, the callback modem responds with the following message:

Password>

3. Type a number-entry password, press the plus key (+), type **ATDT** and the number to call back to, and press **ENTER**. You have three attempts or one minute to enter a valid password.

Note: When you type your phone number, be sure to include the long distance and area codes if they are needed.

4. If the password is valid, the following message appears, and the modems disconnect:
OK Disconnecting
5. After the delay specified by the **#CBDn** command, the callback modem calls the number that you entered after the + character. If the callback modem is unable to establish a connection, it tries again, up to the number of attempts specified by the **#CBA**n command.

6. After the modems reconnect, the following message reappears:

 Password>

7. Type the same password that you used to initiate the call. You have three attempts to enter the password or be disconnected.
8. If the password is valid, the following message appears and the modems establish a working connection:

 OK Connecting

Extension-Entry Callback

Use this procedure when calling from an extension at the callback number. The password that you use must be set up for an optional extension-entry callback.

1. Using a data communications program such as HyperTerminal or PhoneTools, dial the number of the callback modem.
2. When the connection is established, the callback modem responds with the following message:

 Password>

3. Type an extension-entry password, press the plus key (+), type the extension to call back to, and press ENTER. You have three attempts or one minute to enter a valid password.
4. If the password is valid, the following message appears, and the modems disconnect:

 OK Disconnecting

5. After the delay specified by the #CBDn command, the callback modem calls the extension that you entered after the + character. If the callback modem is unable to establish a connection, it tries again, up to the number of attempts specified by the #CBA n command.

6. After the modems reconnect, the following message reappears:

 Password>

7. Type the same password you used to initiate the call. You have three attempts to enter the password or be disconnected.
8. If the password is valid, the following message appears, and the modems establish a working connection:

 OK Connecting

Direct Connection

Use this procedure when you want to connect without first being called back. The password that you use must be set up for an optional direct connection.

1. Using a data communications program such as HyperTerminal or PhoneTools, dial the number of the callback modem.
2. When the connection is established, the callback modem responds with the following message:

Password>

3. Type a direct connection password, press the - key, and then press **ENTER**. You have three attempts or one minute to enter a valid password.
4. If the password is valid, the following message appears and the modems establish a working connection:

OK Connecting

Note: You can make all calls direct connect regardless of whether the password or phone number has the - character by using the **%H1** command

Callback Security Commands

The following **AT** commands are used with callback security. Most can be entered only after the setup password has been entered.

Command: #CBA*n* Callback Attempts

Values: *n* = 1–255

Default: 4

Description: Sets the number of callback attempts that are allowed after passwords have been exchanged between modems. This command can be used only after the setup password has been entered and callback security enabled.

Command: #CBD*n* Callback Delay

Values: *n* = 0–255

Default: 15

Description: Sets the length of time (in seconds) that the modem waits before calling back the remote modem. This command can be used only after the setup password has been entered and callback security enabled.

Command: #CBF? Callback Failed Attempts Display

Values: n/a

Default: n/a

Description: Requests the number of failed callback passwords since reset or power-up. This number can be stored to nonvolatile memory using the **&W** command. This command can be used only after the setup password has been entered and callback security enabled.

Command: **#CBFR** **Callback Failed Attempts Reset**
Values: n/a
Default: n/a
Description: Resets the number of failed callback passwords to 0. This does not reset the number stored in nonvolatile memory. This command can be used only after the setup password has been entered and callback security enabled.

Command: **#CBI***n* **Local Callback Inactivity Timer**
Values: *n* = 1–255
Default: 20
Description: Sets the time (in minutes) that the modem waits for a command before forcing the user to enter the setup password again. This command can be used only after the setup password has been entered and callback security has been enabled for local/remote operation (#CBS1).

Command: **#CBNy=x** **Store Callback Password**
Values: *y* = 0–29
x = password (6–10 characters)
Defaults: None
Description: Sets the callback security password for the *y* memory location. The password must contain 6 to 10 characters, and cannot include the + or - characters. This command can be used only after the setup password has been entered and callback security enabled.

Command: **#CBP***n* **Callback Parity**
Values: *n* = 0, 1, or 2
Default: 0
Description: Sets parity for the callback security messages. The parity of the messages should match the parity of the computer the modem is attached to. This command can be used only after the setup password has been entered and callback security enabled.

#CBP0 No parity.
#CBP1 Odd parity.
#CBP2 Even parity.

Command: **#CBRy** **Callback Security Reset**
Values: *y* = 0–29
Default: None
Description: Clears the password and phone number in the *y* memory location. This command can be used only after the setup password has been entered and callback security enabled.

Command:	#CBSn	Callback Enable/Disable
Values:	$n = 0, 1, 2, \text{ or } 3$	
Default:	0	
Description:		Enables or disables callback security options. When callback security is enabled, phone number memory locations 0–4, used for quick dialing and DTR dialing, become unavailable and are replaced by callback security memory locations 0–29. The phone number memory locations and their contents are restored when callback security is disabled.
	#CBS0	Disables callback security. With this command, the modem connects as if it did not have callback security. This command can be used only after the setup password has been entered.
	#CBS1	Enables local and remote callback security. Local callback security requires that the setup password be entered to use the AT command set. The only AT commands that are available without the setup password are AT , ATI , and AT#Sx . For the remote callback security description, see the #CBS2 description. This command can be used only after the setup password has been entered.
	#CBS2	Enables remote callback security only. When remote callback security is enabled, the modem waits for a call, challenges the remote modem, calls back the remote modem, and challenges the remote modem again. Local security is disabled, allowing calls to be made from the modem without entering the setup password. This command can be used only after the setup password has been entered.
	#CBS3	Temporarily disables callback security if either #CBS1 or #CBS2 is enabled. Callback security remains disabled until the hangup command (+++ATH) is executed locally or the modem is reset. This command can be used only after the setup password has been entered.
Command:	#Sx	Enter Setup Password
Values:	$x = \text{password (1–8 characters, case sensitive)}$	
Default:	MTSMODEM	
Description:		Enters the password used for callback security and remote configuration setup. This command allows the use of all callback security commands.
Command:	#S=x	Store Setup Password
Values:	$x = \text{password (1–8 characters, case sensitive)}$	
Default:	MTSMODEM	
Description:		Stores a new password for callback security and remote configuration setup.
Command:	&V	Display Current Settings
Values:	n/a	
Description:		Displays the modem's active settings, including the telephone numbers stored in nonvolatile memory and the security settings, if enabled. If the setup password has been entered, the passwords are also displayed.

Command:	&Zy=[+][-]x[,???	Store Dialing Command
Values:	<i>y</i> = 0–29 (callback security enabled)	
	<i>x</i> = Dialing command string	
Default:	None	
Description:	Stores dialing command <i>x</i> in memory location <i>y</i> . The command string must begin with AT , and can have up to 35 characters. The telephone number in the command must be preceded by D , DT , or DP . Example: AT&Z0=+-ATM0D5551212,??? . During a call, if the + or - character is not entered after the password, the modem will call back the stored number. This command can be used only after the setup password has been entered and callback security enabled.	
Options:	+ Number entry. Enables the caller to enter a new callback number during password entry. The + character must be the first or second character in the command string. - Direct connection. Enables the caller to choose a direct connection (no callback) during password entry. The - character must be the first or second character in the command string. ,??? Extension entry. Enables the caller to enter an extension number during password entry. The + character must be the first or second character in the command string. The ? characters must follow a comma at the end of the string, and there must be one for each digit in the extension. If the ? characters are included in the dialing command, it is not possible for the caller to enter a new callback number, only an extension for the programmed callback number.	
Command:	%Hn	Direct Connect Enable
Values:	<i>n</i> = 0, 1	
Default:	0	
Description:	%H0 Sets callback security to normal operation. %H1 All callback security calls will be direct connect regardless of whether the password or phone number has the - character.	

Callback Assignments Form

Location	Password	Telephone number
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
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Chapter 7

Modem on Hold Operation

Chapter 7 - Modem on Hold Operation

What Is Modem on Hold?

Your modem supports a feature called Modem on Hold when it is in V.92 mode. Modem on Hold works with your telephone company's Call Waiting service to put a remote modem "on hold" while you answer a voice call. When you finish your conversation and hang up, the previous connection resumes, providing you have not exceeded the time limit. Among other things, this feature eliminates the problem of the modem disconnecting if someone calls you while Call Waiting is enabled.

For this feature to work, you must have Call Waiting service from your telephone company. Also, the remote modem (for example, the modem used by your internet service provider) must support V.92 and Modem on Hold. The duration of the hold time is controlled by your ISP.

Note: MTMh, the Modem on Hold program included with your modem, currently supports only Windows 95, Windows 98, and Windows Me. Future versions are expected to support Windows NT, Windows 2000, and Windows XP. Please check <http://www.multitech.com/SUPPORT/software/> for updates.

The Modem on Hold Program

Modem on Hold operation is controlled through the MTMh program, which is automatically installed when you install the modem driver. A shortcut icon for MTMh is placed on the Windows desktop.

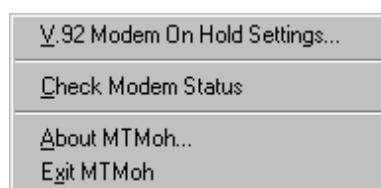
You can start MTMh by double-clicking this icon, or you can make MTMh start each time Windows starts by moving the icon to the Windows StartUp folder.

To move the MTMh icon to the StartUp folder, right-click on the Start button, choose Explore, expand the Programs folder to reveal the StartUp folder, and then drag the MTMh icon onto the StartUp folder.

When MTMh is running, the MTMh icon appears in the Windows system tray:

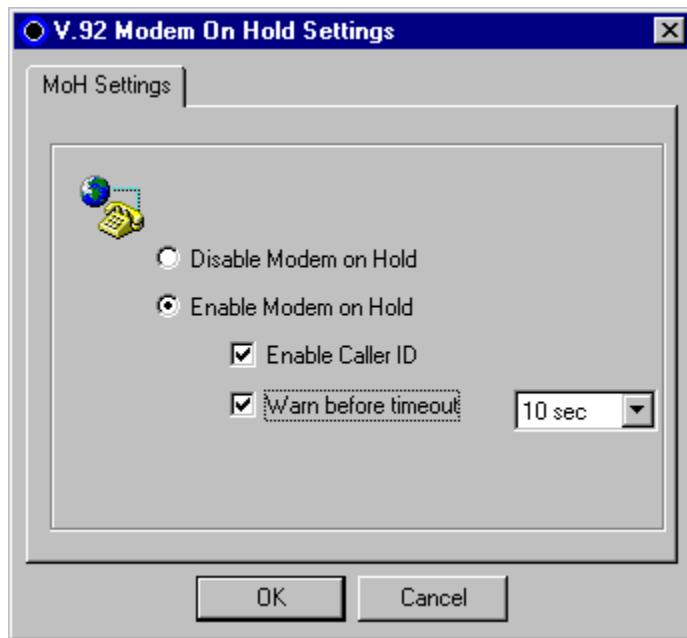


Right-click on the icon to open the MTMh menu:



V.92 Modem on Hold Settings

Select this option to open the **V.92 Modem on Hold Settings** dialog box. (You can also open this dialog box by double-clicking the MTMoh icon.) Use the **V.92 Modem on Hold Settings** dialog box to configure Modem on Hold operations.



Disable Modem on Hold

Select if you do not want to use Modem on Hold.

Enable Modem on Hold

Select if you want the remote modem to be put on hold when you receive a voice call. The **Call Status** dialog box will notify you of an incoming voice call and display Caller ID info, if it is available.

Enable Caller ID

Select if you have Caller ID service and want MTMoh to display information about the caller.

Note: For Caller ID, you must set **S0=2** or greater. See **S0** on page 41.

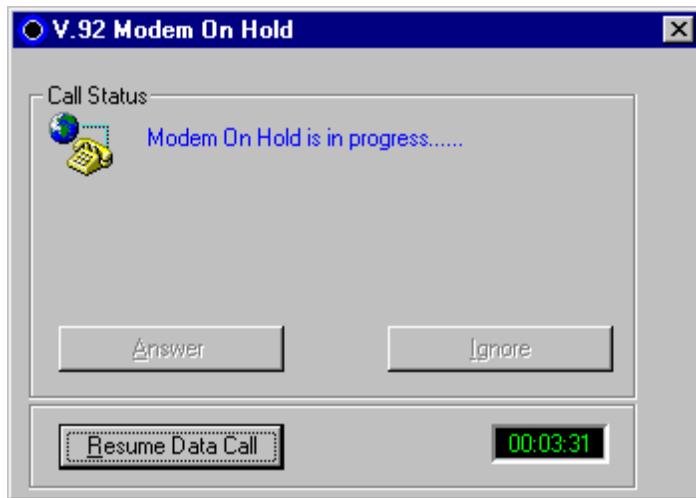
Warn before timeout

Select to have MTMoh warn you when the hold time is about to expire. Click the down arrow to select how far in advance you want to be warned.

Check Modem Status

The **Call Status** dialog box opens automatically when you receive a call. If you close it, you can re-open it by selecting this command. The **Call Status** dialog box displays information about the current call, including Caller ID information, if it is available.

For more on using the **Call Status** dialog box, see “Using Modem on Hold.”



About MTMoh

Select to display MTMoh version information.

Exit MTMoh

Select to quit the MTMoh program. If you do this, Modem on Hold operation will be disabled.

Using Modem on Hold

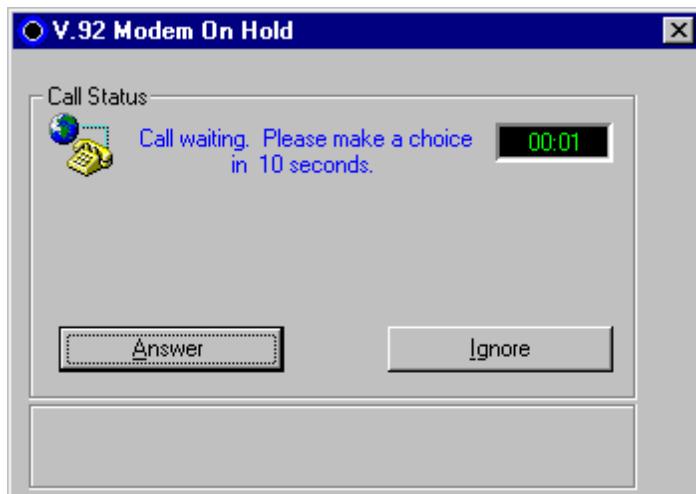
To use Modem on Hold:

- You must have Call Waiting service from your telephone company.
- Your computer must be running Windows 95, 98, or Me.
- Your modem must be set to V.92 mode.
- The MTM9 program must be running.
- **Enable Modem on Hold** must be selected in the **V.92 Modem on Hold Settings** dialog box.
- Your modem must be connected to a remote server that supports V.92 and Modem on Hold.

Answering a Voice Call

When Modem on Hold is enabled, the **Call Status** dialog box appears on your screen whenever you have an incoming call. If Caller ID is enabled, information about the caller is displayed in the dialog box.

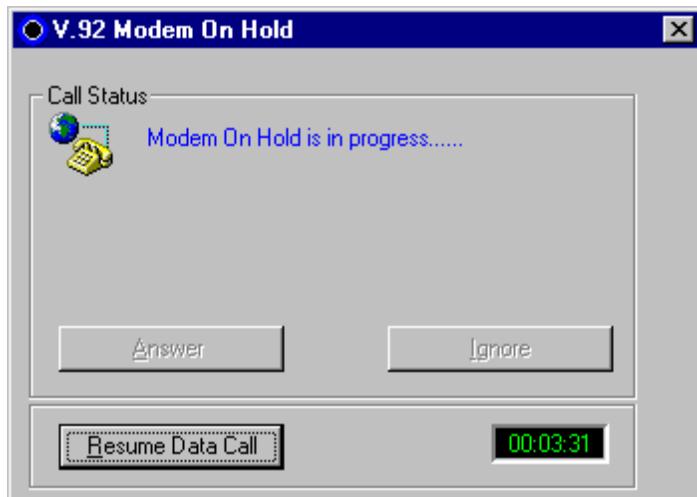
If the remote server is not V.92-capable, the message *Modem on Hold denied* appears instead.



You have ten seconds in which to choose whether to answer a call or ignore it. Click **Answer** to answer a call, or **Ignore** to ignore it.

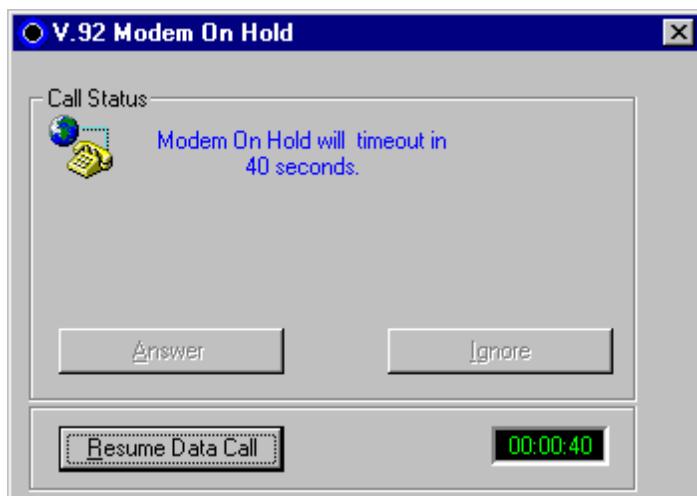
If you click **Ignore** or let the timer time out, the incoming call is ignored, and you can continue your online connection.

If you click **Answer**, you can pick up your telephone and talk to your caller while the remote modem is on hold. When you click **Answer**, the display changes to indicate that the remote modem is on hold. A count-down timer shows how long the remote modem will remain on hold before it automatically disconnects.



Resuming a Data Call

You can complete a voice call at any time and resume your online connection by hanging up the telephone and clicking the **Resume Data Call** button. If **Warn before timeout** is selected in the **V.92 Modem on Hold Settings** dialog box, a warning that the hold time is about to expire appears at the specified time. If you do not click the **Resume Data Call** button, the remote modem automatically disconnects when the time is up.



Chapter 8

Solving Problems

Chapter 8 - Solving Problems

Your modem was thoroughly tested at the factory before it was shipped. If you are unable to make a successful connection, or if you experience data loss or garbled characters during your connection, it is possible that the modem is defective. However, it is more likely that the source of your problem lies elsewhere. The following symptoms are typical of problems you might encounter:

- None of the LEDs light when the modem is on.
- The modem does not respond to commands.
- The modem cannot connect when dialing.
- The modem disconnects while online.
- The modem cannot connect when answering.
- File transfer is slower than it should be.
- Data is being lost.
- There are garbage characters on the monitor.
- The modem doesn't work with Caller ID.
- Fax and data software can't run at the same time.

If you experience problems, please check the following possibilities before calling Technical Support (see Appendix D).

None of the Indicators Light

When you turn on the modem, the LED indicators on the front panel should flash briefly as the modem runs a self-test. If the LEDs remain off, the modem is probably not receiving power.

- ✓ Make sure the modem's power switch is on, especially if you normally turn the modem on by turning on a power strip.
- ✓ If the modem is plugged into a power strip, make sure the power strip is plugged in and its power switch is on.
- ✓ Make sure the power supply is firmly connected to the modem and the power supply's power cord is firmly connected to both to the power supply and the wall outlet or power strip.
- ✓ If the power strip is on and the modem switch is on, try moving the power supply to another outlet on the power strip.
- ✓ Test that the outlet is live by plugging another device, such as a lamp, into it.
- ✓ The modem or power supply may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem or power supply might be defective. Call Technical Support for assistance.

CAUTION: Do not under any circumstances replace the power supply with one designed for another product; doing so can damage the modem and void your warranty.

The Modem Does Not Respond to Commands

- ✓ Make sure the modem is plugged in and turned on. (See “None of the Indicators Light.”)
- ✓ Make sure you are issuing the modem commands from data communication software, either manually in terminal mode or automatically by configuring the software. (You cannot send commands to the modem from the DOS prompt.)
- ✓ Make sure you are in terminal mode in your data communication program, then type **AT** and press **ENTER**. If you get an *OK* response from your modem, your connections are good and the problem likely is in the connection setup in your communication software.
- ✓ Try resetting your modem by turning it off and on. If you are using DOS or Windows 3.1 communication software, make sure the initialization string includes **&F** as the first command, to cancel any “leftover” command that could affect the modem’s operation.
- ✓ If you don’t get an *OK*, the problem may still be in the communication software. Make sure you have done whatever is necessary in your software to make a port connection. Not all communication programs connect to the COM port automatically. Some connect when the software loads and remain connected until the program terminates. Others can disconnect without exiting the program. The modem’s TR indicator lights to show that the software has taken control of the modem through the COM port.
- ✓ Your communication software settings may not match the physical port the modem is connected to. The serial cable might be plugged into the wrong connector—check your computer documentation to make sure. Or you might have selected a COM port in your software other than the one the modem is physically connected to—compare the settings in your software to the physical connection.
- ✓ If the modem is on, the cable is plugged into the correct port, the communication software is configured correctly, and you still don’t get an *OK*, the fault might be in the serial cable. Make sure it is firmly connected at both ends.
- ✓ Is this the first time you have used the cable? If so, it may not be wired correctly. Check the cable description on the packaging to make sure the cable is the right one for your computer.
- ✓ Peripheral expansion cards, such as sound and game cards, might include a serial port preconfigured as COM1 or COM2. The extra serial port, or the card itself, may use the same COM port, memory address, or interrupt request (IRQ) as your communication port. Be sure to disable any unused ports.

Windows 9x: Right-click on My Computer, select **Properties** from the menu, click on the **Device Manager** tab, double-click on **Ports**, then double-click on the communication port your modem is connected to. In the port’s **Properties** sheet, click on the **Resources** tab to see the port’s input/output range and interrupt request. If another device is using the same address range or IRQ, it appears in the **Conflicting Device List**. Uncheck **Use automatic settings** to change the port’s settings so they do not conflict with the other device, or select the port the conflicting device is on and change it instead. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device’s documentation.

Windows NT 4.0: To look for address or IRQ conflicts, click Start, Programs, Administrative Tools (Common), and Windows NT Diagnostics. In the **Windows NT Diagnostics** dialog box, click the **Resources** tab to see which input/output ranges and interrupt requests are in use. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device’s documentation.

- ✓ The serial port might be defective. If you have another serial port, install the modem on it, change the COM port setting in your software, and try again.
- ✓ The modem might have a problem beyond the scope of this user guide. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, call Technical Support for assistance (see Appendix D).

The Modem Cannot Connect When Dialing

There can be several reasons the modem fails to make a connection. Possibilities include

- lack of a physical connection to the telephone line.
- a wrong dial tone.
- a busy signal.
- a wrong number.
- no modem at the other end.
- a faulty modem, computer, or software at the other end.
- incompatibility between modems
- poor line conditions.

You can narrow the list of possibilities by using extended result codes. Extended result codes are enabled by default. If they have been disabled, include **V1X4** in the modem's initialization string, or in terminal mode enter **ATV1X4** and press **ENTER**. When you dial again, the modem reports the call's progress.

- ✓ If the modem reports *NO DIALTONE*, check that the modem's telephone line cable is connected to both the modem's LINE jack (not the PHONE jack) and the telephone wall jack. If the cable looks secure, try replacing it. If that doesn't work, the problem might be in your building's telephone installation. To test the building installation, plug a telephone into your modem's telephone wall jack and listen for a dial tone. If you hear a dial tone, your modem might be installed behind a corporate phone system (PBX) with an internal dial tone that sounds different from the normal dial tone. In that case, the modem might not recognize the dial tone and might treat it as an error. Check your PBX manual to see if you can change the internal dial tone; if you can't, change your modem's initialization string to replace **X4** with **X3**, which will cause the modem to ignore dial tones (note, however, that **X3** is not allowed in some countries, such as France and Spain).
- ✓ If the modem reports *BUSY*, the other number might be busy, in which case you should try again later, or it might indicate that you have failed to add a **9**, prefix to the phone number if you must dial **9** for an outside line.

If you must dial **9** to get an outside line, the easiest way to dial it automatically is to include it in the modem's dial prefix, e.g., **ATDT9,**. Note the comma, which inserts a pause before the number is dialed. By inserting **9** into the dial prefix, you do not have to include it in each directory entry.

To change the dial prefix in Windows HyperTerminal, select **Connect** from the **Call** menu, click **Dialing Properties**, and type **9** in the local and long distance boxes in **How I dial from this location**.

- ✓ If the modem reports *NO ANSWER*, the other system has failed to go off-hook, or you might have dialed a wrong number. Check the number.
- ✓ If the modem reports *NO CARRIER*, the phone was answered at the other end, but no connection was made. You might have dialed a wrong number, and a person answered instead of a computer, or you might have dialed the correct number but the other computer or software was turned off or faulty. Check the number and try again, or try calling another system to make sure your modem is working. Also, try calling the number on your telephone. If you hear harsh sounds, then another modem is answering the call, and the modems might be having problems negotiating because of modem incompatibilities or line noise. Try connecting at a lower speed.
- ✓ Poor line conditions can affect the connection. When using V.34 or V.32 client-to-client connections in poor conditions, setting **S38=0** may result in better performance.

The Modem Disconnects While Online

- ✓ If you are not using Modem on Hold, Call Waiting can interrupt your connection when someone tries to call you. If you have Call Waiting service, disable it before each call. In most telephone areas in North America, you can disable Call Waiting by preceding the telephone number with ***70** (but first check with your local telephone company).

You can automatically disable Call Waiting by including the disabling code in the modem's dial prefix (e.g., **ATDT*70,**—note the comma, which inserts a pause before the number is dialed). To change the dial prefix in Windows HyperTerminal, select **Connect** from the **Call** menu, click **Dialing Properties**, check **This location has Call Waiting**, and select the correct code for your phone service.

To learn more about Modem on Hold, see Chapter 7.

- ✓ If you have extension phones on the same line as your modem, you or someone else can interrupt the connection by picking up another phone. If this is a frequent problem, disconnect the extension phones before using the modem, or install another phone line especially for the modem.
- ✓ Check for loose connections between the modem and the computer, the telephone jack, and AC power.
- ✓ You might have had a poor connection because of line conditions or the problem might have originated on the other end of the line. Try again.
- ✓ Your ISP might have hung up on you because of lack of activity on your part or because you exceeded your time limit for the day. Try again.

The Modem Cannot Connect When Answering

- ✓ The default DTR Control command (**&D2**) inhibits autoanswer. To enable autoanswer, change DTR Control to **&D0**, and make sure **&Q0**, **&Q5**, or **&Q6** is also set. For more information, see the **&D** command in Chapter 4. For information on changing the modem's default configuration, see "Step 6: Install and Configure Your Software" in Chapter 2.
- ✓ Autoanswer might be disabled. Turn on autoanswer in your communications program or send the command **ATS0=1** (**ATS0=2** if you have Caller ID service) to your modem in terminal mode.

File Transfer Is Slower Than It Should Be

- ✓ If you are using a slow transfer protocol, such as Xmodem, try Zmodem or Ymodem/G instead.
- ✓ Is your line noisy? If there is static on your line, the modem has to resend many blocks of data to insure accuracy. You must have a clean line for maximum speed.
- ✓ Are you downloading a compressed file with MNP 5 hardware compression enabled? Since hardware data compression cannot compress a file already compressed by an archiving program, the transfer can be marginally slower with data compression enabled than with it disabled.
- ✓ Does your Internet service provider (ISP) use the same 56K protocol as your modem? The default setting of your modem is to connect using either the V.92 or the V.90 protocol, depending on which one the ISP's modem is using. If your ISP uses the V.90 protocol, the maximum speed you will be able to upload at is 33,600 bps. Check with your ISP to see which protocols it supports.
- ✓ Are you trying to send a file to another client modem? If so, then your maximum possible connect speed is 33,600 bps. You can upload at speeds up to 48,000 bps only when connected to an ISP that supports the V.92 protocol.
- ✓ Try entering the **I11** command in online mode or the **&V** command in command mode to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

Data Is Being Lost

- ✓ If you are using data compression and a high speed serial port, set the serial port baud rate to two to six times the data rate.
- ✓ Make sure the flow control method you selected in software matches the method selected in the modem. If you are using the modem with a Macintosh, you might have the wrong cable for hardware flow control.
- ✓ Try entering the **I11** command in online mode or the **&V** command in command mode to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

There Are Garbage Characters on the Monitor

- ✓ Your computer and the remote computer might be set to different word lengths, stop bits, or parities. If you have connected at 8-N-1, try changing to 7-E-1, or vice-versa, using your communication software.
- ✓ You might be experiencing line noise. Enable error correction, if it is disabled, or hang up and call again; you might get a better connection the second time.
- ✓ At speeds above 2400 bps, the remote modem might not use the same transmission or error correction standards as your modem. Try connecting at a slower speed or disabling error correction. (With no error correction, however, line noise can cause garbage characters.)
- ✓ Try entering the **I11** command in online mode or the **&V** command in command mode to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

The Modem Doesn't Work with Caller ID

- ✓ Caller ID information is transmitted between the first and second rings, so if autoanswer is turned off (**S0=0**) or if the modem is set to answer after only one ring (**S0=1**), the modem will not receive Caller ID information. Check your initialization string, and if necessary change it to set the modem to answer after the second ring (**S0=2**).
- ✓ Make sure that you have Caller ID service from your telephone company.

Fax and Data Software Can't Run at the Same Time

- ✓ Communication devices can be accessed by only one application at a time. Under DOS or Windows 3.1x, you can run either your fax software or your data communications software, but not both at the same time, unless you have a special communication device management application. In Windows 95 and higher, you can have data and fax communication applications open at the same time, but they cannot use the same modem at the same time.

Appendices

Appendix A - Regulatory Compliance

Appendix B - Technical Specifications

Appendix C - Upgrading the Modem

Appendix D - Installing a Modem Under Linux

Appendix E - Connecting to a Cisco Router

Appendix F - Warranty, Service, & Technical Support

Appendix A - Regulatory Compliance

FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.
2. The suitable USOC jack (Universal Service Order Code connecting arrangement) for this equipment is shown below. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See installation instructions for details.
4. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company.
5. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
6. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
7. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
9. This equipment should not be used on party lines or coin lines.
10. If so required, this equipment is hearing-aid compatible.

Manufacturer: Multi-Tech Systems, Inc.
Trade Name: MultiModemZBA
Model Number: MT5634ZBA-V-V92
FCC Registration No: AU7USA-24713-M5-E
Ringer Equivalence No: 0.3B
Modular Jack (USOC): RJ11C or RJ11W (single line)
Service Center in USA: Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112
U.S.A.
(763) 785-3500
(763) 785-9874 Fax

FCC Part 15

This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Plug the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC rules. Operation of this device is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Fax Branding Statement

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device, including fax machines, to send any message unless such message clearly contains the following information:

- Date and time the message is sent
- Identification of the business or other entity, or other individual sending the message
- Telephone number of the sending machine or such business, other entity, or individual

This information is to appear in a margin at the top or bottom of each transmitted page or on the first page of the transmission. (Adding this information in the margin is referred to as *fax branding*.)

Since any number of fax software packages can be used with this product, the user must refer to the fax software manual for setup details. Typically the fax branding information must be entered via the configuration menu of the software.

Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada label does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment or equipment malfunctions may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement Canadien sur le matériel brouilleur.

International Modem Restrictions

Some dialing and answering defaults and restrictions may vary for international modems. Changing settings may cause a modem to become non-compliant with national telecom requirements in specific countries. Also note that some software packages may have features or lack restrictions that may cause the modem to become non-compliant.



EMC, Safety, and R&TTE Directive Compliance

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;
and
- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;
and
- Council Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

New Zealand Telecom Warning Notice

1. The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.

This equipment is not capable under all operating conditions of correct operation at the higher speed which it is designated. 33.6 kbps and 56 kbps connections are likely to be restricted to lower bit rates when connected to some PSTN implementations. Telecom will accept no responsibility should difficulties arise in such circumstances.

2. Immediately disconnect this equipment should it become physically damaged, and arrange for its disposal or repair.
3. This modem shall not be used in any manner which could constitute a nuisance to other Telecom customers.
4. This device is equipped with pulse dialing, while the Telecom standard is DTMF tone dialing. There is no guarantee that Telecom lines will always continue to support pulse dialing.

Use of pulse dialing, when this equipment is connected to the same line as other equipment, may give rise to 'bell tinkle' or noise and may also cause a false answer condition. Should such problems occur, the user should not contact the Telecom Faults Service.

The preferred method of dialing is to use DTMF tones, as this is faster than pulse (decadic) dialing and is readily available on almost all New Zealand telephone exchanges.

5. Warning Notice: No '111' or other calls can be made from this device during a mains power failure.
6. This equipment may not provide for the effective hand-over of a call to another device connected to the same line.
7. Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom's Specifications:

For repeat calls to the same number:

- There shall be no more than 10 call attempts to the same number within any 30-minute period for any single manual call initiation, and
- The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt.

For automatic calls to different numbers:

- The equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another.

For automatically answered incoming calls:

- The equipment shall be set to ensure that calls are answered between 3 and 30 seconds of receipt of ringing.

8. For correct operation, total of the RNs of all devices connected to a single line at any time should not exceed 5.

South African Notice

This modem must be used in conjunction with an approved surge protection device.

Appendix B - Technical Specifications

The MultiModemZBAV-V92 modem meets the following specifications:

Trade Name	MultiModemZBA™
Model Number	MT5634ZBA
Build Number	MT5634ZBA-V-V92
Server-to-Client Data Rates	56K speeds when accessing a V.90 or V.92 server (actual speed depends on server capabilities and line conditions)*
Client-to-Server Data Rates	Up to 48Kbps when accessing a V.92 server (actual speed depends on server capabilities and line conditions); otherwise the same as client-to-client data rates.
Client-to-Client Data Rates	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400, 1200, 0-300 bps
Fax Data Rates	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400, 300 bps
Voice Compatibility	TIA/EIA IS-101(Voice Option only)
Data Format	Serial, binary, asynchronous
Modem Compatibility	ITU-T V.92, V.90, V.34 enhanced, V.34, V.32bis, V.32, V.22bis, V.22; Bell 212A and 103/113; ITU-T V.21 & V.23; V.42, V.42bis, V.44.
Fax Compatibility	ITU-T "Super" Group 3; Class 1.0, 2.0, 2.1; T.4; T.30; V.21; V.27ter; V.29; V.34; V.17; and TIA/EIA Class 1, 2; TR29.2
Video Compatibility	ITU-T V.80 for H.324 video conferencing
Error Correction	ITU-T V.42
Data Compression	ITU-T V.44 (6:1 throughput), V.42bis (4:1 throughput), MNP 5 (2:1 throughput)
Speed Conversion	Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200, and 230,400 bps
Mode of Operation	Fax online modes; full duplex over dial-up lines
Flow Control	XON/XOFF (software), RTS/CTS (hardware)
Intelligent Features	Plug and play; fully AT command compatible; autodial, redial, repeat dial; pulse or tone dial; dial pauses; auto answer; adaptive answer; EIA extended automode; adaptive line probing; automatic symbol and carrier frequency during start-up, retrain, and rate renegotiation; DTMF detection; call status display, auto-parity and data rate selections; keyboard-controlled modem options; non-volatile memory; remote configuration; DTR dialing; callback security; A-law support in 56K modes; 11-bit support; real-time fax compression

*Though this modem is capable of 56K bps download performance, line impairments, public telephone infrastructure and other external technological factors may prevent maximum 56K bps connections.

conversion; U.S. Caller ID reporting; quick-connect startup; Modem on Hold (only when connected to a V.92 server).	
Command Buffer	40 characters
Lightning Protection	FCC Part 68 A/B surge
Transmit Level	-11 dBm (North America)—varies by country setting
Frequency Stability	±0.01%
Receiver Sensitivity	-43 dBm under worst-case conditions
AGC Dynamic Range	43 dB
Interface	TIA/EIA RS-232C/ITU-T V.24/V.28
Connectors	DB25F RS-232C connector; RJ-11 telephone jack, power jack
Cables	Country-specific telephone and power cables Note: Any cables connected to the computer should be shielded to reduce interference.
Diagnostics	Power-on self test, local analog loop, local digital loop, remote digital loop.
Indicators	LEDs for Transmit Data, Receive Data, Carrier Detect, 56K bps, 33.6K bps, 14.4K bps, Off Hook, Terminal Ready, Error Correction, Fax.
Speaker	Internal speaker for call progress monitoring.
Manual Control	Power switch
Environmental	Temperature range 0°–50°C (32°–120°F) ambient under closed conditions; humidity range 20–90% (non-condensing)
Storage Temperature	-10° to +85°C (14°–185°F)
Power Requirements	100–130/230VAC, 50/60 Hz, 5 W (universal power supply)
Power Consumption	9 VDC, 300 mA maximum
Dimensions	10.8 cm wide x 14.8 cm long x 2.9 cm high (4.25" x 5.8" x 1.15")
Weight	224 g (8 oz)
Limited Warranty	10 years

Appendix C - Upgrading the Modem's Firmware

Introduction

Your modem is controlled by semi-permanent software, called *firmware*, which is stored in flash memory. Firmware is nonvolatile; that is, it remains stored in memory when the modem is turned off. However, it can be changed by either the manufacturer or the user as bugs are fixed or new features are added.

Since the firmware in your modem is stored in flash memory, you can upgrade it yourself in a few minutes by using the following procedures.

Upgrade Overview

The upgrade procedure consists of the following steps, which are described in greater detail in the following sections.

1. Identify the model number and firmware version of your modem.
2. Identify the current version of the firmware at the Multi-Tech Web site or BBS. If your modem already has the current firmware, there is no need to update it.
3. Download the upgrade file and the appropriate Flash Wizard for your modem.
4. Install the Flash Wizard and extract the firmware .HEX file from the file you downloaded.
5. Document and clear your stored parameters.
6. Upgrade the modem's firmware using the .HEX file and the Flash Wizard.
7. Restore your parameters.

Step 1: Identify the Modem Firmware

You must know the model number and firmware version of your Multi-Tech modem to know whether or not you should update it.

1. Run your favorite terminal program. If you are using Windows 95 or above, you can use Windows HyperTerminal.
2. In the program's terminal window, type **AT&F**. Even if you cannot see the **AT&F** command on your screen, be sure to type it completely, and then press **ENTER**. If the modem does not respond with *OK*, repeat the **AT&F** command.
3. Now type **ATI**, press **ENTER**, and record your results. The model number and firmware version should appear similar to that shown below.

LT V.92 1.0 MT5634ZBA-V-V92 Serial Voice/Data/Fax Modem Version 1.25k

Step 2: Identify the Current Firmware Version

Identify the current version of the firmware at the Multi-Tech Web site. If your modem already has the current firmware, there is no need to update it.

1. Using your favorite Web browser, go to <http://www.multitech.com/SUPPORT/MultiModemZBA/firmware.asp>.
2. Scroll down to your modem model number.
3. Look at the firmware version number for your modem.
4. If the firmware version number matches the firmware version number found in "Step 1: Identify the Modem Firmware," you have the current firmware version and do not need to be updated.
5. If the firmware version number is greater than the firmware version number found in "Step 1: Identify the Modem Firmware," your modem has an older firmware version. Continue with "Step 3: Download the Upgrade File."

Warning: The first digit of the new firmware must match the first digit of the old firmware, or the modem may not work properly. E.g., if your current firmware version is 4.16, replace it only with 4.xx firmware, not 6.xx firmware.

Step 3: Download the Upgrade File

1. If you are not already at the MultiModemZBA Firmware page of the Multi-Tech Web site, follow the procedure in "Step 2: Identify the Current Firmware."
2. Download the upgrade file for your modem by clicking its name, and save the file in a temporary folder on your hard disk.
3. In the same section of the Web page, click the Flash Wizard utility for your operating system to download it, and save it in the same folder.

Step 4: Extract the Upgrade Files

1. Install the Flash Wizard utility by double-clicking the file name in Windows Explorer.
2. Extract the upgrade files by double-clicking the file name. The extracted files include a .HEX file, which contains the upgrade data, and a Readme file.
3. Copy the upgrade .HEX file into the Flash Wizard folder, which, in a default installation, is at C:\Program Files\MultiTech Systems\Flash Wizard\.

Step 5: Clear Your Stored Parameters

Before you flash your modem, you should record the parameters that are currently stored in it, so you can reprogram it after flashing. After you have recorded them, send the **AT&W1Z** command to the the modem to clear the stored parameters.

1. Run your favorite terminal program. If you are using Windows 95 or above, you can use Windows HyperTerminal.
2. In the program's terminal window, type **AT&V** and press **ENTER** to list your modem's current parameters.
3. Record your parameters by saving the screens and sending them to your printer.
4. Type **AT&W1Z** and press **ENTER** to clear your stored parameters and reset your modem to factory default.
5. Close the terminal program.

Step 6: Upgrade the Modem's Firmware

Before you begin the following procedure, read the README.TXT file extracted from the upgrade archive file. Note the file name for the new firmware (example: ARQG125A.HEX).

WARNING: Never install an older version of firmware over a newer version. Doing this WILL DESTROY THE FLASH PROM! If the flash PROM is destroyed, the modem must be sent in for repair.

1. Run Flash Wizard by double-clicking its icon or file name, or by selecting it from the Start menu. The **Identifying Devices** dialog box is displayed as Flash Wizard locates and identifies the devices connected to your system.

Note: If the message *ERROR: No valid devices detected* is displayed, verify that the modem is turned on and that all cables are correctly and securely attached.

2. Click the modem to be upgraded, and then click **Next** to proceed.
3. Select the port to be upgraded from the **Port** list, select the appropriate .HEX file from the **Hex File** list, and then click **Next** to continue.

Note: Do not use FLASHLDR.HEX. This file is used internally by Flash Wizard.

4. The **Progress** dialog box appears, showing a status bar that indicates the progress of the upgrade.

Caution: Any disruption of the program during this stage of the upgrade can cause your modem to become inoperable. Wait for the **Next** button to become active before proceeding.

5. When the flash upgrade is complete, the message *Programming Complete* appears. Click **Next** to continue.
6. The **Results** dialog box appears next. Click **Finish** to exit Flash Wizard.

Step 7: Restore Your Parameters

Your modem has been updated. You can now open your terminal program to reprogram your modem parameters or to confirm the update by typing **ATI** in the terminal window and pressing **ENTER**.

Appendix D - Installing a Modem Under Linux

Introduction

This appendix explains how to install a modem on a computer operating under the Red Hat Linux 6.2 operating system. Other versions of Red Hat and other Linux operating systems should be similar. Briefly, in Linux, you do not need drivers for most standard external modems and most internal ISA bus modems. Programs in Linux commonly call upon the port, rather than the modem.

Standard Linux Serial Port Definitions

PC port	Linux port
Com1	ttyS0
Com2	ttyS1
Com3	ttyS2
Com4	ttyS3

Installation

Connect the external modem to an available serial port.

Setup

This section describes how to make sure Linux can talk to the modem and be able to dial up to the Internet. Linux can use different programs and desktops depending on who made the Linux operating system and what version it is. The following procedures use the most commonly installed components of Red Hat 6.2. More information can be found in your Linux OS owner's manual.

Using the Terminal Program Minicom to Verify Operation

1. At the command prompt, type **minicom -s** and press **ENTER**.
2. Select **Serial port setup** and press **ENTER**.
3. From **Serial port setup**, use the **A** key to access **Serial Device**, and then press **ENTER**.
4. Press **Esc**.
5. You are now in the Minicom terminal. Type **AT** and press **ENTER**. The screen should display **OK** to verify the operation. Alternately, dial a phone number to verify line operation
6. To leave Minicom, press **CTRL + A**, and then press **Z**.
7. On the help menu, press **X** to exit.

Using the Modem to Call the Internet

Linux allows different graphic user interfaces (GUI). In the following steps, we'll use the Gnome Desktop GUI and assume that the Internet Service Provider (ISP) you are calling assigns you the Domain Name Service (DNS) and Internet Protocol (IP) addresses. For more information on DNS or IP, see the Linux OS owner's manual or contact your ISP.

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.
2. Select **Internet** from the menu.
3. Select **Dialup Configuration Tool**.
4. Select **Add**, and then click **Next**.
5. Enter the connection name and phone number, and then click **Next**.
6. Enter your user name and password, and then click **Next**.
7. Select **Normal ISP** if your ISP is not listed, and then click **Next**.
8. Click **Finish**.

Calling the ISP

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.
2. Select **Internet** from the menu.
3. Select **RH PPP Dialer**.
4. Select the connection name you entered in step 5 of the previous section.
5. Click **OK**.

Answering Calls

To use the system for answering calls, Linux requires other programs to be installed, such as Mgetty, Mgetty+Sendfax, and others, depending on your requirements. Each vendor of Linux has more than adequate information on installing these programs.

Appendix E - Connecting to a Cisco Router

This appendix provides information on how to connect an MT5634ZBA-V-V92 modem to a Cisco® router.

Connecting to a Cisco Router Console Port

The console port on the Cisco IOS® router is an asynchronous serial port configured as data communications equipment (DCE). For Cisco 1000, 1600, 2500, 2600, and 3600 series routers, the console port uses an RJ-45 connector.

WARNING: Do not connect the modem to the Cisco router's auxiliary port. This procedure and document apply only to the Cisco router's console port.

Step 1: Configure the Modem for your Country

Configure the modem defaults to match the requirements of the country in which it will be used. For information on how to do this, see "Step 5: Configure the Modem for your Country" in Chapter 2.

Step 2: Configure for Callback Security in Direct Connect Mode

Callback security requires a caller to give a correct password before sending data to the system. If you do not plan to use this feature, skip to Step 3.

Note: Setting the modem for callback security in direct connect mode disables the remote configuration feature of the modem.

To Turn Direct Connect Callback Security On and Off

Callback security must be turned on to enter many callback security commands.

1. Using a terminal program such as HyperTerminal, type the command **AT#Sxxxxxxxx**, where **xxxxxxxx** is your password (1 to 8 characters long), and press **ENTER**. The modem responds with **OK** if the setup password is correct, and **ERROR** if it is wrong. The default password is **MTSMODEM**.

If you wish to change the password, then type the command **AT#S=xxxxxxxx**, where **xxxxxxxx** is the new password (1 to 8 characters long), and press **ENTER**.

2. Type one of the following commands:
 - To turn on remote callback security only, type **AT#CBS2** and press **ENTER**.
 - To turn on both local and remote callback security, type **AT#CBS1** and press **ENTER**. When local security is turned on, you must enter the setup password before you can enter any AT command from a local terminal except the **AT**, **ATIn**, and **AT#Sxxxxxxxx** commands.
3. Type **AT&W0** to store the above commands to nonvolatile memory.

Note: For other callback security modes of operation, see Chapter 6.

To Set the Parity of the Callback Security Messages

The parity of the modem's password prompt and messages must match the parity of the computer to which the modem is connected.

1. The default parity setting for your modem is no parity (**AT#CBP0**). To change the modem's prompt messages to use even parity, type **AT#CBP2** and press **ENTER**. For odd parity, type **AT#CBP1** and press **ENTER**.
2. To store the new parity value, type **AT&W** and press **ENTER**.

To Assign Callback Passwords

1. To store a callback password for the first callback memory location, type **AT#CBN0=xxxxxxxx**, where **xxxxxxxx** is the first password, and press **ENTER**. The password must be unique, must be six to ten characters in length, and must not contain a + or - character.
2. To store a callback password for the second callback memory location, type **AT#CBN1=xxxxxxxx**, where **xxxxxxxx** is the second password, and press **ENTER**. Note that the memory location number in the command is incremented by one.
3. Repeat as many times as necessary, up to memory location 29, until all passwords have been entered.
4. To review your entries, type **AT&V** and press **ENTER**.
5. To set the modem for direct connect mode, type **AT%H1** and press **ENTER**.

To Call a Modem Configured for Callback Security

1. Using a terminal program and an originating modem, dial the number of the modem connected to the Cisco router, which we will call the "remote modem."
2. When the connection is established, the remote modem responds with the following message:
Password>
3. Type a direct connection password, and press **ENTER**. You have three attempts or one minute to enter a valid password.
4. If the password is valid, the message *OK Connecting* appears, and the modems establish a working connection.

Step 3: Console Port Final Setup

Send the following command string to the modem being connected to the console port of the Cisco router:

AT%R1&W0

The **%R1** command sets **E0**, **Q1**, **&D0**, **&K0**, **\$SB9600**, and **%S1**, and the **&W0** command stores the commands to memory. The **%R1** command sets the following functions:

E0	Turns command echo off
Q1	Turns result codes off
&D0	Ignores DTR from the DTE
&K0	Selects no flow control
\$SB9600	Sets the serial baud rate to 9600 bps.
%S1	Disables command mode at all serial speeds except 115200 bps.

The modem is now configured for use on the Cisco router console port.

Note that command echo and result codes have been turned off. If it becomes necessary to send additional AT commands to the modem after it has been so configured, there will be little feedback from the modem that it has received and acted upon the command. Only commands such as **ATI0** that request specific data from the modem will send any data to the DTE as an indication that the modem has accepted the command. Temporarily turning on command echo and result codes might ease reconfiguration of the modem.

When the modem is connected to the console port, turn the modem off and then on again. This will set the serial baud rate to 9600 bps as the **\$SB9600** command is implemented.

Console Port Connections

To connect a personal computer to the console port, use the RJ-45-to-RJ-45 roll-over cable and either the RJ-45-to-DB-25 female DTE adapter or the RJ-45-to-DB-9 female DTE adapter (labeled "TERMINAL").

Cable Pin-outs and Cabling Guide

Console (DTE) signal	Console port RJ-45 pin	Console cable RJ-45 pin	Adapter DB-9 pin	Adapter DB-25 pin	Modem (DCE) signal
RTS	1	8	8	4	RTS
DTR	2	7	6	20	DTR
XMT	3	6	2	2	XMT
GND	4	5	5	7	GND
GND	5	4	5	7	GND
RCV	6	3	3	3	RCV
DSR	7	2	4	6	DSR
CTS	8	1	7	5	CTS

Remote Configuration

The configuration of the modem described in Step 3 contains the core settings that allow the modem to function properly on the console port of the Cisco router. Commands in this section may be done remotely by calling into the MT5634ZBA-V92 attached to the console port with another modem.

Note: Setting country configuration and turning on callback security cannot be done remotely. Nor can all commands be executed remotely if the remote modem is set for callback security; remote configuration of a modem so configured is not recommended.

1. Establish a data connection with a remote MT5634ZBA-V92 modem.
2. Send three remote configuration escape characters followed by **AT** and the setup password, and then press **ENTER**. Example: **%%%ATMTSMODEM**. You have four tries to enter the correct password before being disconnected. If the password is correct, the remote modem may respond with **OK**.

Note: If the modem has previously been configured with command echo off and result codes off, it may be difficult to determine if the remote modem is responding to commands. The **ATI** command can be used for this purpose. Even with echo and result codes off, the modem will respond with the requested ID string if it is properly receiving the command.

3. You can now send AT commands to configure the remote modem.

4. When you have finished configuring the remote modem, save the new configuration by typing **AT&W0<CR>**, then type **ATO<CR>** to exit remote configuration. You can then break the connection in the normal way.

Note: This step is important to ensure that the connection is broken cleanly.

Appendix F - Warranty, Service, and Technical Support

Multi-Tech Systems, Inc. Warranty & Repairs Policies

Warranty

Multi-Tech Systems, Inc., (hereafter "MTS") warrants that its products will be free from defects in material or workmanship for a period of two, five, or ten years (depending on model) from date of purchase, or if proof of purchase is not provided, two, five, or ten years (depending on model) from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory – transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Repair Procedures for U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota factory:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112
Attn: Repairs, Serial # _____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS.

Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check or purchase order for repair charges.

For out of warranty repair charges, go to www.multitech.com/documents/warranties

Extended two-year overnight replacement service agreements are available for selected products. Please call MTS at (888) 288-5470, extension 5308 or visit our web site at <http://www.multitech.com/programs/orc/> for details on rates and coverage's.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at (800) 972-2439 or email tsupport@multitech.com. Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at (800) 328-9717 or (763) 717-5631, or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Customers (Outside U.S.A. and Canada)

Your original point of purchase Reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product.

<http://www.multitech.com/COMPANY/offices/DEFAULT.ASP>

In the event that factory service is required, products may be shipped, freight prepaid to our Mounds View, Minnesota factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. A Returned Materials Authorization (RMA) is required for products shipped from outside the U.S.A. and Canada. Please contact us for return authorization and shipping instructions on any International shipments to the U.S.A. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check drawn on a U.S. bank or your company's purchase order for repair charges. Repaired units shall be shipped freight collect, unless other arrangements are made in advance.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you or email tsupport@multitech.com. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +(763) 717-5631 in the U.S.A., or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Distributors

Procedures for International Distributors of Multi-Tech products are on the distributor web site.

<http://www.multitech.com/PARTNERS/login/>

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Online Warranty Registration

If you have access to the World Wide Web, you can register your Multi-Tech product online at <http://www.multitech.com/register/>.

Service

U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota, factory:

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Mounds View, MN 55112

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For out of warranty repair charges, go to <http://www.multitech.com/documents/warranties>.

Extended two-year overnight replacement agreements are available for selected products. Please call MTS at 888 288-5470, extension 5308, or visit our web site at <http://www.multitech.com/PRO-GRAMS/orc> for details on rates and coverages.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at 800 972-2439 or e-mail tsupport@multitech.com.

Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at 800 328-9717 or +763 785-3500, or e-mail mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

International Customers (outside U.S.A. and Canada)

Your original point of purchase reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product: <http://www.multitech.com/COMPANY/offices/DEFAULT.ASP>.

In the event that factory service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota, factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. A Returned Materials Authorization (RMA) is required for products shipped from outside the U.S.A. and Canada. Please contact us for return authorization and shipping instructions on any international shipments to the U.S.A. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check drawn on a U.S. bank or your company's purchase order for repair charges. Repaired units will be shipped freight collect, unless other arrangements are made in advance.

Please direct questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you, as listed at <http://www.multitech.com/COMPANY/offices/DEFAULT.ASP>., or e-mail tsupport@multitech.com. When calling the U.S., please direct questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at +763 717-5631 in the U.S.A., or e-mail mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

International Distributors

Procedures for international distributors of Multi-Tech products are on the Distributor Web site at <http://www.multitech.com/PARTNERS/login/>.

Replacement Parts

SupplyNet, Inc., can supply you with replacement power supplies, cables and connectors for selected Multi-Tech products. You can place an order with SupplyNet via mail, phone, fax or the Internet at the following addresses:

Mail: SupplyNet, Inc.
614 Corporate Way
Valley Cottage, NY 10989

Phone: 800 826-0279

Fax: 914 267-2420

Email: info@thesupplynet.com

Internet: <http://www.thesupplynet.com>

Technical Support

Multi-Tech Systems has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, please call 800 972-2439 (USA and Canada) or 763 785-3500 (international and local). Please have modem information available. You can also contact Technical Support by e-mail at the following addresses:

Country	Email	Telephone
France:	support@multitech.fr	+(33) 1-64 61 09 81
India:	support@multitechindia.com	+91 (124) 6340778
U.K.:	support@multitech.co.uk	+(44) 118 959 7774
U.S.A., Canada	tsupport@multitech.com	800 972-2439
Rest of world:	tsupport@multitech.com	+763 717-5863

Please note the status of the modem before contacting Technical Support. Status information can include the state of the LED indicators, screen messages, diagnostic test results, problems with a specific application, etc.

Internet Sites

Multi-Tech is a commercial provider on the Internet. Multi-Tech has a Web site at <http://www.multitech.com> and an ftp site at <ftp://ftp.multitech.com>

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